# Railway Mechanical Engineer

**Founded in 1832 as the American Rail-Road Journal**
*With which are also incorporated the National Car Builder, American Engineer and Railroad Journal, and Railway Master Mechanic. Name Registered, U. S. Patent Office*

## May, 1931

*Volume 105* *No. 5*

### Motive Power Department:

Boiler Feed Pump Mounted on the Tender .... 223
The Huntington Shops of the Chesapeake & Ohio 224
Layouts of Locomotives on Curves ..... 233
Two Freight Locomotives Designed for Fast Service. ..... 237

### Car Department:

Chicago & North Western 200-ton Flat Cars .. 221
South African Refrigerator Cars ..... 241

### General:

Radiography of Railway Materials—A Correction 240

### Editorials:

A New Idea in Shop Management ..... 243
X-Ray Inspection of Railway Materials ..... 243
Boiler Conditions Now—and Then! ..... 244
Grinding Locomotive Journal Bearings ..... 244
Piston-Rod and Cylinder Packing ..... 245
New Books ..... 245

### Reader's Page:

Does This Comply with Owner's Standards? .. 246
Master Mechanic Is Wrong About Foremen's Organizations ..... 246
Old-Time Air Jammer Replies to His Critics .. 246
Discuss Rules at Car Foremen's Meeting? Yes! 247
Setting Southern Valve Gear — Information Wanted ..... 247

### Car foremen and Inspectors:

Grand Trunk Western Car-Washington Facilities ..... 248
Decisions of Arbitration Cases ..... 250
Scaffolding in Coach Shops of the F. E. C. .. 251
Stand for Repairing Triple and Distributing Valves ..... 252
Applying Springs to McCord Journal-Box Lids .. 252
Turning Taper on Push Poles ..... 253
Triple Valve Tool Grinder ..... 254
Slotting Decking To Clear Rivet Heads ..... 254

### Back Shop and Enginehouse:

Gear-Operated Cylinder Center ..... 255
Device for Lifting Air Reservoirs into Position 255
Investigation of Surfaces of Locomotive Journal Bearings ..... 256
Combination Mandrel ..... 258
Lift-Shaft Turner ..... 259
Piston-Valve Puller and Inspection Rack ..... 259
Broaching Tender Brasses ..... 260

### New Devices

Cyclone Spark Arrester ..... 261
Armite Arcweld and Hard-Surface Products .. 262
Hot Bearing Indicator ..... 262
Demountable Rim for Band Saws ..... 262
Rowell Car Mover and Wrench for Hopper Bottom Cars ..... 263
Helical Cutter for Milling Side Rods ..... 263
The Lewis Seal-Tite Bolt ..... 264
The Kellocater Jig Boring Machine ..... 264
Garlock Button-Hole Asbestos Tape ..... 265
Automatic Inertia Crank Pin Lubricator ..... 265

**Clubs and Associations ..... 266**

**News ..... 268**

**Buyers Index .....56 (Adv. Sec.)**

**Index to Advertisers ....68 (Adv. Sec.)**

Published on the first Thursday of every month by the

**Simmons-Boardman Publishing Company**

34 North Crystal Street, East Stroudsburg, Pa. Editorial and Executive Offices,
**30 Church Street, New York**

Chicago: 105 West Adams St. | Washington: 17th and H Streets, N. W | Cleveland: Terminal Tower | San Francisco: 215 Market St

EDWARD A. SIMMONS, *President, New York*
LUCIUS B. SHERMAN, *Vice-Pres., Chicago*
HENRY LEE, *Vice-Pres., New York*
SAMUEL O. DUNN, *Vice-Pres., Chicago*
CECIL R. MILLS, *Vice-Pres., New York*
FREDERICK H. THOMPSON, *Vice-Pres., Cleveland, Ohio*
ROY V. WRIGHT, *Sec'y., New York*
JOHN T. DEMOTT, *Treas., New York*

Subscriptions, including the eight daily editions of the Railway Age published in June, in connection with the biennial convention of the American Railway Association, Mechanical Division, payable in advance and postage free: United States, Canada and Mexico, $3.00 a year; foreign countries, not including daily editions of the Railway Age, $4.00.

*The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.) and is indexed by the Industrial Arts Index and also by the Engineering Index Service.*

**Roy V. Wright**
Editor, New York

**C. B. Peck**
Managing Editor, New York

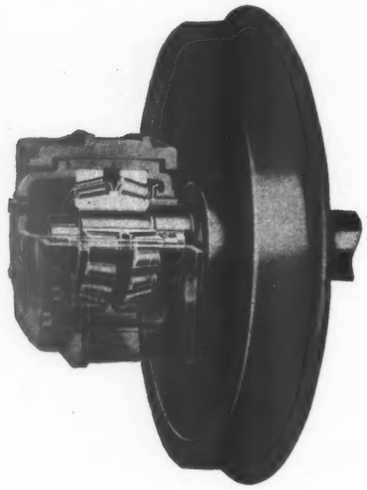
**E. L. Woodward**
Western Editor, Chicago

**Marion B. Richardson**
Associate Editor, New York

**H. C. Wilcox**
Associate Editor, Cleveland

**W. J. Hargest**
Associate Editor, New York

**Robert E. Thayer**
Business Manager, New York



# Timken Railroad Bearings

→ **ELIMINATE**
- Friction
- Hot boxes
- Delays
- Winter bearing troubles
- Lubrication difficulties
- Necessity for frequent attention

→ **SAVE**
- Power
- Lubricant
- Maintenance cost

→ **PROVIDE**
- Riding ease
- On time performance
- Reliability
- A strong sales point

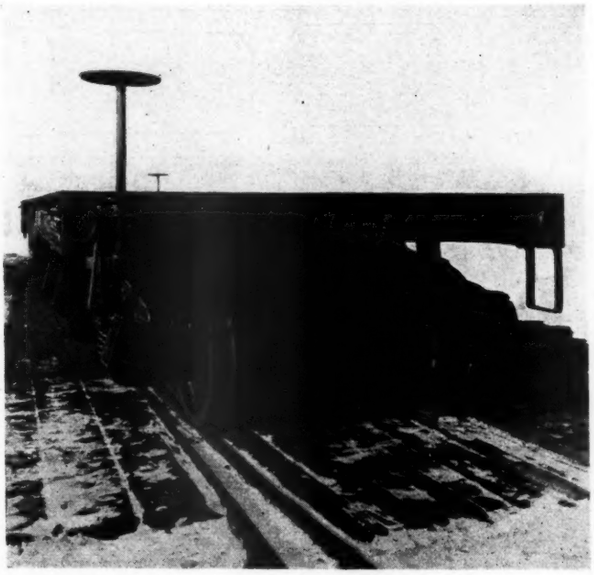
→ **LENGTHEN**
- Shopping periods
- Life of locomotives
- " " rolling stock
- " " axles
- " " wheels
- " " truck and car parts

# You need them in your motive power and rolling stock

Railway
Mechanical Engineer

Founded in 1832 as the American Rail-Road Journal

May - 1931



Front view of C. & N.W. 200-ton flat cars showing coupler - release mechanism and hand-brake application

# Chicago & North Western 200 - Ton Flat Cars

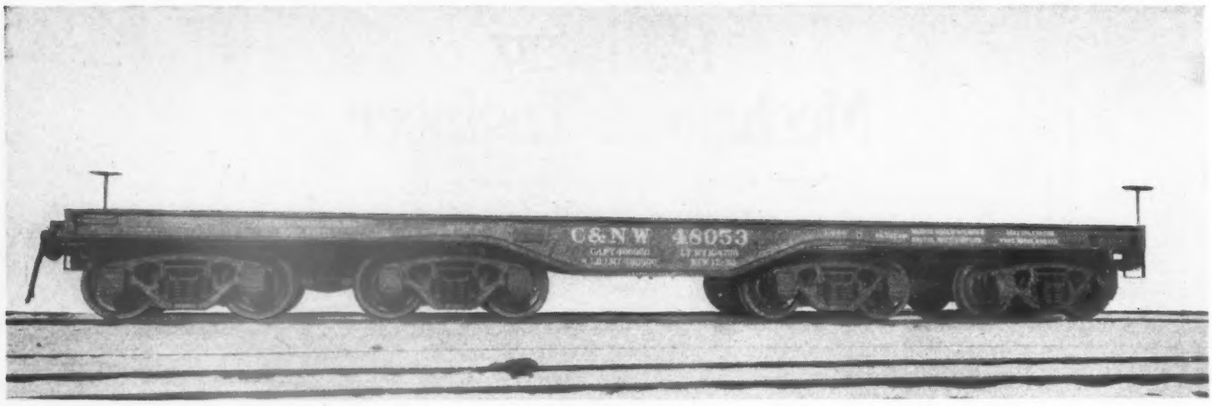
THE Chicago & North Western has recently placed in service two 200-ton special flat cars which will be used largely in handling heavy machinery out of the Milwaukee, Wis., territory. These cars, built at the Chicago shops of the railroad, weigh a total of 104,700 lb. and embody cast-steel construction practically throughout. The cast-steel frame weighs 42,060 lb. The combination of two trucks and span bolster, constituting the truck equipment at each end of the car, has a combined weight of 25,395 lb. The cars are equipped with a ⅜-in. steel-plate floor which is slotted crosswise with numerous holes to facilitate the fastening of lading.

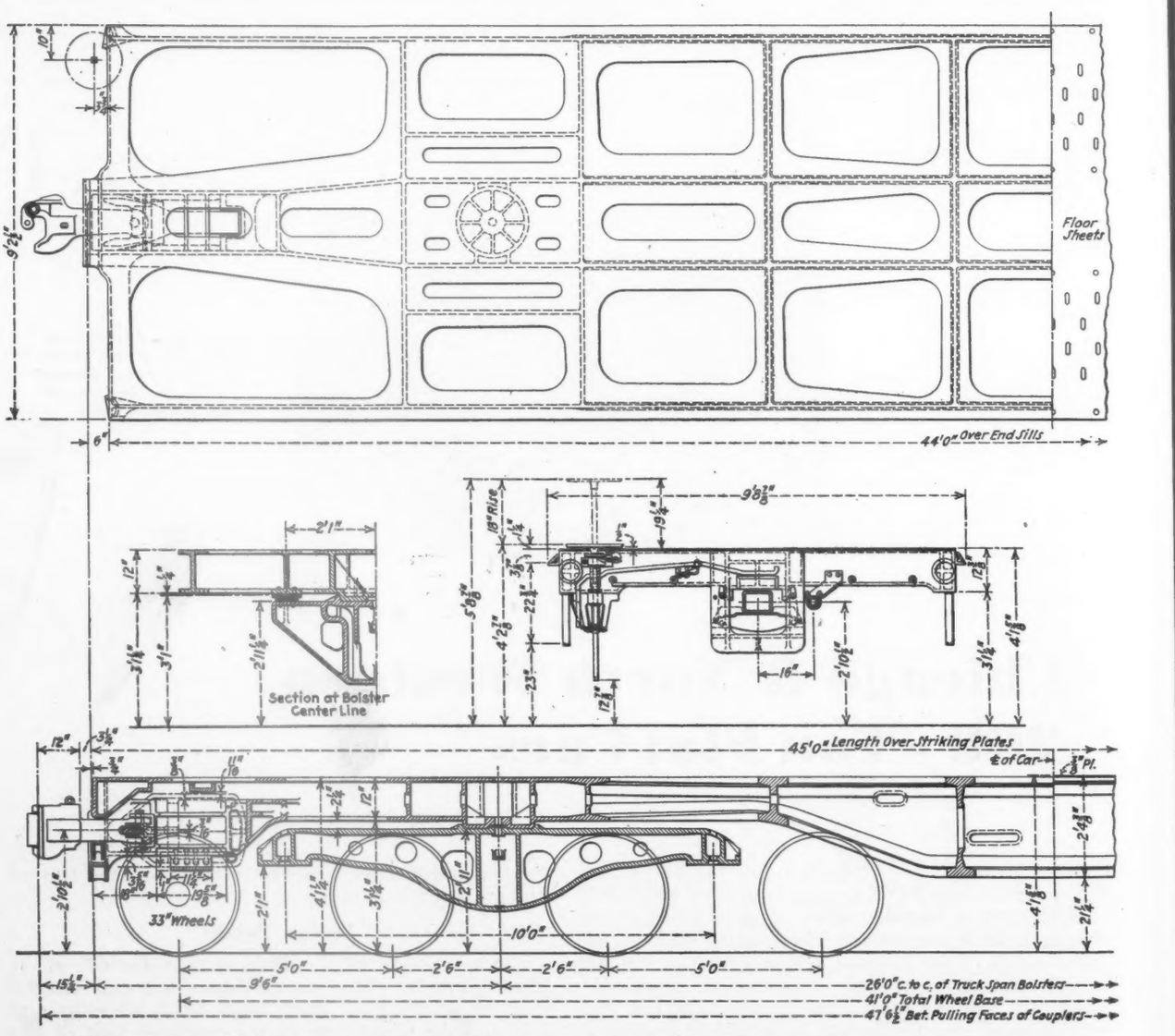
The advantages gained from the use of cast steel construction in these cars are anticipated to include, first, reduced maintenance on account of the one-piece body and, second, longer life on account of less loss of strength from corrosion.

### Design Details

The trucks are of the Dalman type for 6½-in. by 12-in. journals. The journal boxes are cast integral with the side frames. Each truck has a wheel base of 5 ft. and the wheel base of the combined unit of two trucks and span bolster at each end of the car is 15 ft. The center plates of the cast-steel frame are spaced 26 ft. apart and set back 9 ft. 6 in. from the striking plate at each end of the car.

The draft gear application is somewhat unusual in that two gears are provided at each end of the car, one placed above the other in a cast-steel yoke. The hand-brake application is such that the brake shaft at each




**Above: C. & N. W. 200-ton flat car for handling heavy machinery loads—Below: Plan and sections of the car**

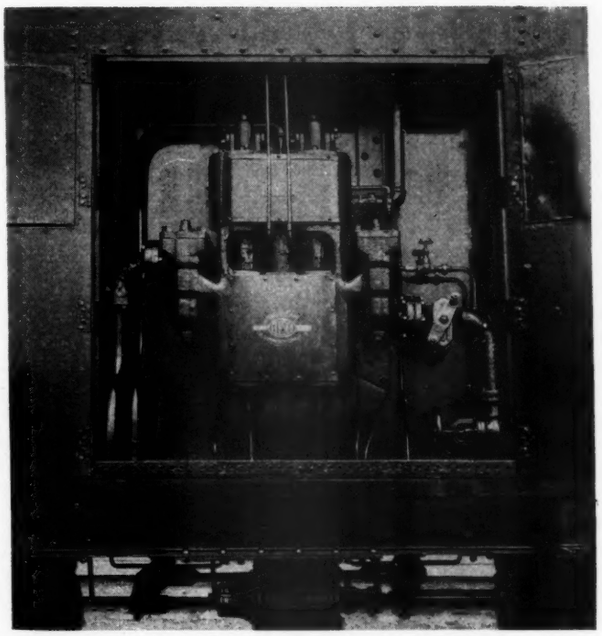
end of the car operates the brakes on the two trucks at that end of the car, only. One end of the car showing the hand brake installation is shown in one of the illustrations.

The accompanying table gives a complete list of specialties used in the construction of the cars.

**Specialties Used on C. & N. W. 200-Ton Special Flat Cars**

| Product | Manufacturer |
|---|---|
| Air brake—Two complete sets, schedule KD-1012 | Westinghouse Air Brake Co. |
| Body center plate—Cast steel, intergral with underframe | General Steel Castings Corp., Commonwealth division |
| Brake beam—A. R. A. No. 3 | American Steel Foundries |

| | |
|---|---|
| Brake beam hanger—Loop-type, drop forged | Schaefer Equipment Company |
| Brake-beam suspension—Four-point support and No. 54 safety arms | Davis Brake Beam Company |
| Coupler—Type D, top-operating with shank arranged for Symington swivel butt | American Steel Foundries |
| Coupler centering device | Union Metal Products Company |
| Coupler release rigging | National Malleable & Steel Castings Co. |
| Draft gear—No. 151—Two at each end of car | Waugh Equipment Company |
| Dust guards | Dust Guards, Inc. |
| Hand brake, high power drop brake shaft | Union Railway Equipment Company |
| Journal box—A.R.A. 6½-in. by 12-in. cast steel, cast integral with truck side frame | ..... ..... |
| Journal-box lid—Non-hood, with pin retainer and the Mohun spring | Railway Steel Spring Company |
| Paint—Code letter "A"—No. 1 mineral paint | Chicago & North Western |
| Pipe—Standard full weight, genuine wrought iron | ..... |
| Side bearing—Friction type, having ½-in. wear plates | ..... |
| Springs—A.R.A. Class H cluster of double coil springs with two double coil springs of the A.R.A. Class H spring | ..... |
| Truck bolster—Cast steel, Dalman type | Buckeye Steel Castings Company |
| Truck span bolster—Cast steel | Buckeye Steel Castings Company |
| Truck side frame—Cast steel, Dalman type | Buckeye Steel Castings Company |
| Truck bottom connection—Drop forged, off-set connection | Schaefer Equipment Company |
| Underframe—Cast steel, fish belly type | General Steel Castings Corp., Commonwealth division |
| Wheels—33-in. multiple-wear wrought steel with 1923 tread | Illinois Steel Company |
| Coupler yoke—Cast steel Pattern | Chicago & North Western |
| Yokes | American Steel Foundries |



**The Elesco boiler feed pump is mounted in a compartment on the left side of the tender midway between the two trucks**

# Boiler Feed Pump Mounted on the Tender

***By H. B. Bowen****

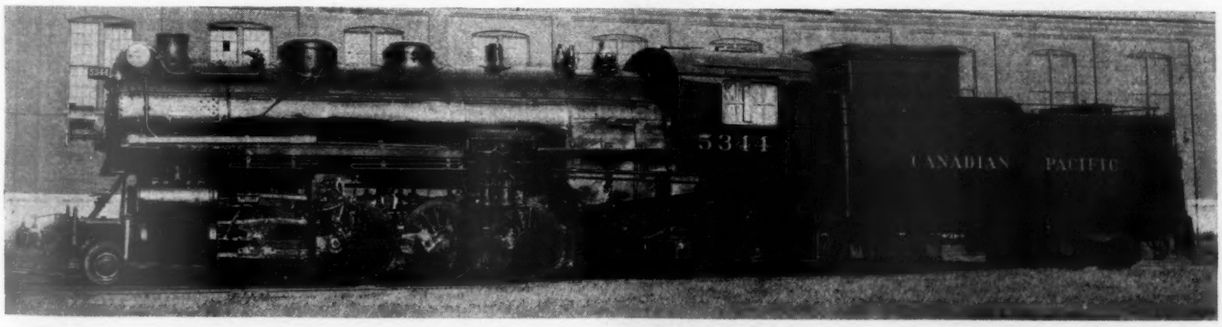
AN interesting and satisfactory application of an Elesco CF-1 boiler feed pump, located in a compartment provided in the tender tank, was recently made on the Canadian Pacific Mikado type locomotive 5344. The pump compartment is 72 in. long and 18 in. deep and is located on the left side of the tank in a position midway between the two tender trucks. The pump is mounted on suitable brackets which are securely fastened to the tender underframe in such a manner that the weight of the pump is transferred directly to the underframe.

Flexible metallic connections are provided between the engine and tender for conveying live steam to the pump and the pump discharge to the feedwater heater. The pump exhaust is carried to an Elesco standard oil skimmer located within the tender tank. The pump suction is taken from near the bottom of the tank through the combined strainer and elbow connections to a suitable shut-off valve.

The tender tank location for a boiler feed pump seems to offer a number of advantages over the conventional location on the side of the boiler. Some of the most important, perhaps, being the exclusion of the pump liner and bracket from the boiler, with its necessary rivets and studs, the decrease in weight on the engine proper and the transfer of the weight of the boiler feed pump to a location where, as a rule, a desirable distribution can be obtained.

In addition to the foregoing, the tender tank location facilitates inspection. Not the least important on a modern locomotive where weight is almost invariably a predominating factor, a tender tank location permits the use of a reciprocating type of pump without encroaching on weight limitations. While from the viewpoint of new locomotive design all of the features above mentioned are very desirable, there are also additional advantages when applying feedwater heater equipment to existing locomotives, in which case the application may be made without the necessity of altering the location of air pumps, running boards, running board brackets, air reservoirs, etc. This interesting boiler feed pump application is made on the locomotive shown below.

* Chief of motive power and rolling stock, Canadian Pacific.




**The Canadian Pacific locomotive on which the boiler feed pump is located on the tender—The plates covering the compartment can be seen on the tank**

# The Huntington Shops of The Chesapeake & Ohio

**A modern locomotive repair plant designed and equipped for a definite output of 50 class 2 and 3 repairs each full working month**

THERE are two facts concerning the new Chesapeake & Ohio locomotive repair shops at Huntington, W. Va., which make them of exceptional interest to mechanical men—they embody a most effective combination of the advantages of both the longitudinal and transverse shop and they were designed in their entirety and in each individual unit for a definite ultimate output capacity of 50 heavy classified repairs a month.

At Huntington, over a period of many years, the mechanical officers of the Chesapeake & Ohio have had the advantage of actual experience with both types of repair shops at a single location. The original shop, built a number of years ago, was a transverse shop, the machine and erecting portions of which were under one roof. With the great increase in the size of power used on the C. & O., a portion of which is of the heavy Mallet type, it became necessary in 1918 to construct a shop to handle these locomotives. A longitudinal type shop, 70 ft. by 400 ft. was built, having three tracks, each with a capacity of four Mallet type locomotives. This shop was served by two 150-ton traveling cranes which were used for handling the engines. A lean-to, 40 ft. in width, was constructed along the south side of this shop for machinery, the length of which was 265 ft. Under the old layout Mikado and larger locomotives were brought in through the Mallet shop, unwheeled and held on the two outside tracks in the Mallet shop because of the limited length of the tracks in the old machine and boiler shop. Smaller locomotives were unwheeled by an overhead engine hoist located in the south end of the transverse shop and moved over a transfer table to the erecting or boiler shop. In 1926 a new boiler shop was built which lies about 150 ft. east of the old machine shop and is served by a transfer table operating in the space between the boiler and machine shop. With the increasing use of heavy power, the old machine and erecting facilities became inadequate, and while the track space in the Mallet shop was of insufficient capacity, the most limiting feature of the old facilities was the fact that the Mallet shop was of insufficient height to permit handling of locomotives back and forth over the tops of others in the shop which made it necessary to keep the center track open to provide an inlet and outlet to the shop as a whole.

In laying out and constructing the new shops, the only units of the old group which were used were the boiler shop, blacksmith shop and the old Mallet shop. Both the Mallet shop and the boiler shop have, however, been enlarged while the old machine shop and the transfer table were entirely removed and replaced by a large modern building having a 25-pit erecting bay, a heavy machine bay, a light machine bay and a fourth bay which is taken up by driving-box, axle and wheel work. All of the units in the new layout adjoin each other without separating walls and may, therefore, be said to be under one roof in-so-far as operation is concerned.

With this rearrangement of facilities practically all of the disadvantages encountered in the old shop have been overcome and the combination of the longitudinal arrangement of the old shop with the transverse of the new erecting shop has made it possible so to schedule the machine and erecting operations on locomotives passing through the shop for repairs that a considerable saving in the time which locomotives need be held out of service for major repairs has been effected.

### Arrangement of Facilities

The Mallet shop was enlarged by the addition of a 52-ft lean-to bay on the north side. This bay has a mezzanine floor 16 ft. above the main floor of the shop and a second floor 26 ft. above the main floor, the main floor being occupied by the pipe shop, jacket shop and air pump department; the mezzanine floor by locker and wash rooms, and the second floor by the tin shop and brass room. Electric freight elevators of 6,000-lb. capacity for handling trucks and materials serve the different floors in this bay.

The new main shop structure consists of four principal units. The erecting bay is 95 ft. wide by 608 ft. long, having 25 pits. This bay is served by one 250-ton crane and three 15-ton messenger cranes. A clear height of 55 ft. 8 in. under the roof trusses permits the movement of locomotives, not only one over another on the pits, but over the messenger cranes as well. The pits in the erecting bay are spaced 24 ft. between centers, providing adequate room for working between them. These pits are 85 ft. long by 4 ft. wide and are provided with plank jacking floors along both sides. All of the pit tracks are at least 115 ft. long and extend 25 ft. from the east end of the pits into the wheel bay, providing storage space for repaired wheels directly on the pit tracks. Six of the tracks extend 37 ft. into the heavy machine bay and one other track, near the center of the bay, extends across the entire shop layout through the boiler shop to a flue shop east of the boiler shop and through the machine shop bays to a blacksmith shop building which lies west of the light machine bay.

To the west of the erecting bay are two machine bays, the first, 80 ft. wide being used for heavy machine work and the second, 60 ft. wide, for light machine work. The lengths of these bays are 550 ft. and they abut on the Mallet shop at the north end. The heavy machine bay has a clear height of 50 ft. to the trusses and is served by two 15-ton cranes. The light machine bay has a second floor throughout its entire length 28 ft. above the first floor and a mezzanine floor 25 ft. wide along the west wall, 16 ft. above the first floor. Both of these upper floors are connected to the main floor by stairways and are open on the side facing the main shop. The mezzanine floor over the light machine bay is occupied by wash and locker rooms and the shop supervisory offices, while the second floor is occupied by a chemical laboratory, turret lathe department and manufacturing tool room. Under the chemical laboratory, on the main floor of the light machine bay, is a physical testing laboratory.

Along the east side of the erecting shop is an additional bay 80 ft. wide, 625 ft. long and 38 ft. high, used for wheel, axle, driving-box, superheater and steam-pipe work.

The boiler shop unit which lies alongside the new wheel bay is 140 ft. wide by 530 ft. long and is served by two crane runways—one of 87 ft. span having one 50-ton and one 15-ton crane and the other of 47 ft. span for two 15-ton cranes. The center section of the boiler shop bay is occupied by the tender repair shop and two test pits and repair racks for tender tanks. The north end of the boiler bay is occupied by the tender frame and tender truck shop having five tracks served by a transfer table, two of which are through tracks from the transfer table through the tank shop, the wheel shop, erecting bay and Mallet shop to the west end of the shop. In an emergency locomotives may be taken into or out of the shop from either the east or west side. East of the transfer table serving the tender shop a modern sand-blast plant has been installed.

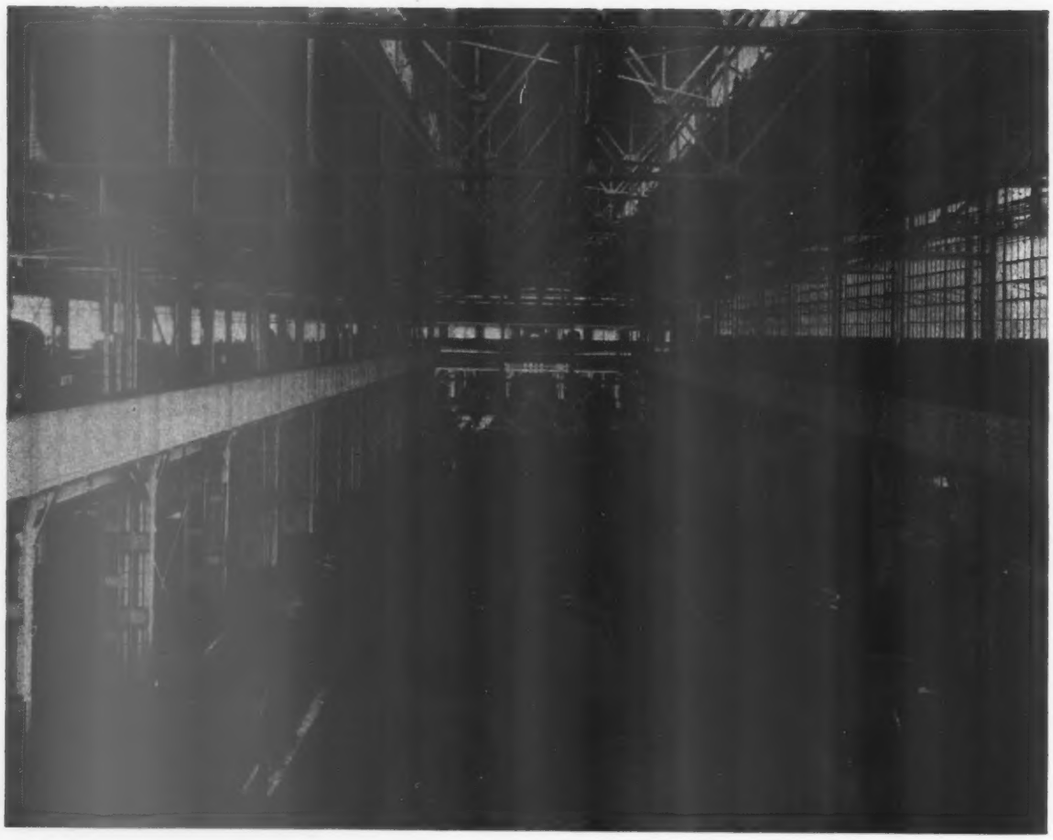
Seventeen traveling cranes of various types and capacities serve the different shop units. All of these cranes are modern high-speed cranes which will permit the handling of parts with the least possible delay. A large number of smaller capacity cranes, mostly of the jib type, have been installed throughout the shop for the purpose of handling work to and from machines without the necessity of calling on the overhead cranes. The majority of these smaller cranes are equipped with two-ton electric hoists.

### General Scheme of Operation

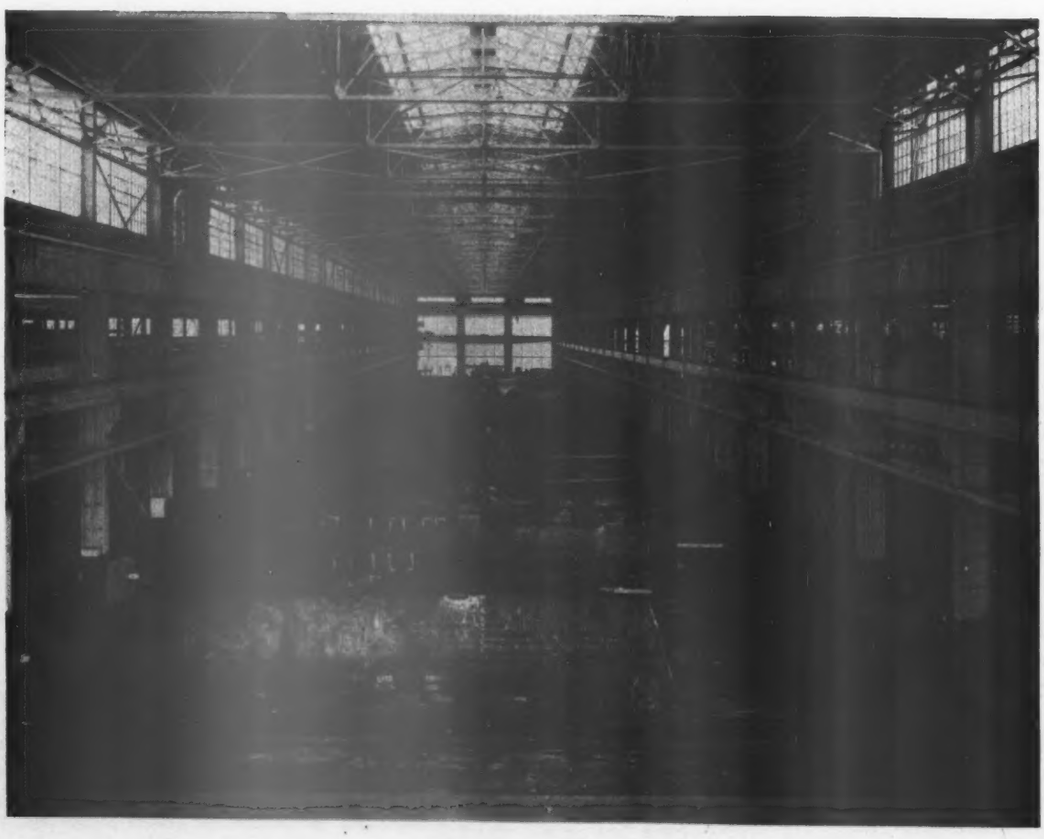
The Huntington shops were designed with a view to providing the maximum output of locomotives receiving heavy classified repairs with the least possible detention from service and at a minimum expenditure for labor. For this reason the layout of the new shops includes the most modern machine tools and material handling and other shop equipment, and the location of the different groups and units is governed by time- and labor-saving principles. The most modern ideas of plant layout were embodied in the arrangement of the different departments with respect to each other and in the individual units located in each, taking advantage wherever possible of mass-production methods and a straight-line movement of materials and parts over the shortest possible distances.

Complete detailed time studies were first made to determine the number of operations necessary to repair a given number of locomotives per month. This study automatically determined the type, size and capacity of the machine tools required in the plant to produce a balanced shop operation for all of the several depart-

**The entrance to the longitudinal shop—Coal transfer conveyor in the foreground, tender storage tracks at the left**



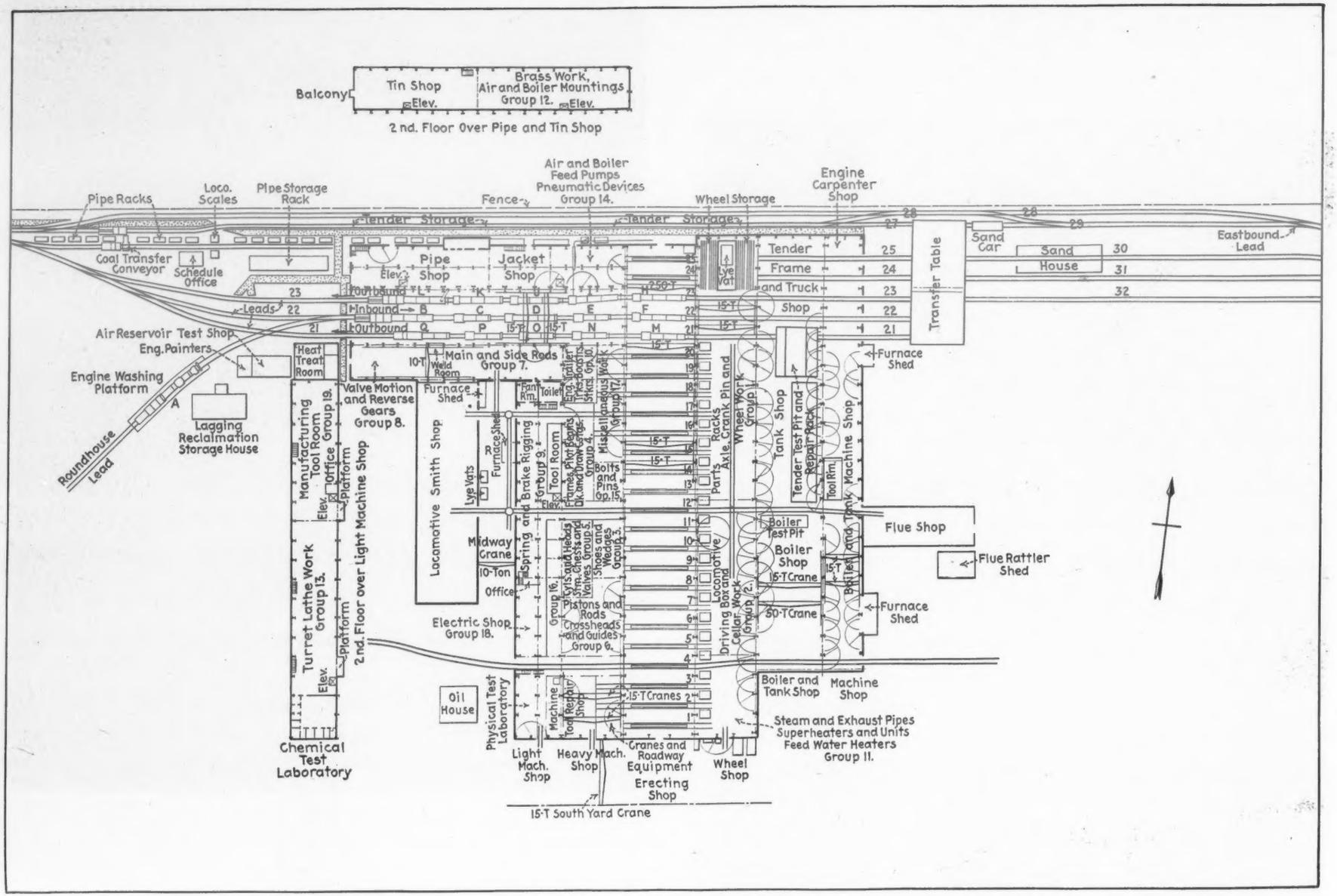
Looking East through the longitudinal part of the shop to the transverse section — Mezzanine and second floors may be seen at the left of the shop



The erecting shop has twenty-five transverse pits

The wheel bay

The boiler and tank shop — Tender tank test racks are shown in the foreground




**The Huntington shop is an effective combination of the longitudinal and transverse type of shop**

The Huntington shop is an effective combination of the longitudinal and transverse type of shop

ments. As far as machine tools are concerned, each group or department is equipped with all of the machine tool and shop facilities necessary to perform all of its operations within the allotted schedule time without assistance from other departments or groups. It has been possible in the Huntington shop arrangement to accomplish this result with a surprisingly small duplication of machine and other facilities.

While, of course, under present business conditions it has not been necessary to work the shop at its maximum capacity, the entire plant was designed to turn out 50 Class 2 and 3 locomotive repair jobs each full working month of 25 eight-hour days. The shop has space to accommodate 37 locomotives undergoing repairs at one time. Using all of these spaces continuously, the maximum capacity of the shop would be indicated by 37 times 25, or 925 pit-days per month. The ultimate capacity of 50 locomotives per month was arrived at by dividing the number of pit days by the average number of days required per locomotive for the above mentioned classes of repairs. This was found to be 18.5 working days for the different classes of locomotives on the C. & O., nearly 30 per cent of which are of the Mallet articulated type. On the above program, the shop would be capable of turning out 17 Mallets a month, three of which would receive Class 2 repairs and 14 Class 3 repairs, and in addition, 33 other type locomotives, six receiving Class 2 repairs and 27 receiving Class 3 repairs.

The co-ordination of the work of all departments is accomplished by means of a shop schedule and routing system. In the initial operation of the shop certain maximum schedules were applied which, as time goes on, will be shortened or adjusted as actual operating conditions in the shop indicate to be desirable. At the present time, the average schedules of the days required for locomotives to be in the shop undergoing different classes of repairs are indicated in Table I.

**Table I—Average Schedules, Days in Shop**

| | | | Average days per engine on | | |
|---|---|---|---|---|---|
| | Days per engine in shop | Total pit days, all engines | Inbound progressive positions, Track 22 | Heavy repair pits 1-20 and 20-25 inclusive | Outbound progressive positions, Tracks 21 and 23 |
| 3 Mallets, Class 2 (New fire box) | 25 | 75 | 3½ | 16½ | 5 |
| 14 Mallets, Class 3 (genl. repairs) | 20 | 280 | 2½ | 12½ | 5 |
| 17 Mallets | Total | 355 | | | |
| 6 other locos. Class 2 (new fire box) | 23 | 138 | 3½ | 14½ | 5 |
| 27 other locos. Class 3 (genl. repairs) | 16 | 432 | 2½ | 8½ | 5 |
| 33 other locomotives | Total | 570 | | | |
| 50 per month | Average | 18.5. Total 925 | | | |

Exclusive of the inbound and outbound progressive positions in the shop there are 22 pits available for heavy-repair work. In accordance with the average number of days required as shown in the above table, there are 22 times 25 pit days, or 550 pit days involved in the heavy repair-work, distributed as follows:

| | |
|---|---|
| 3 Mallets, Class 2 repairs @ 16.5 days | 49.5 |
| 14 Mallets, Class 3 repairs @ 12.5 days | 175.0 |
| 6 other locomotives, Class 2 repairs @ 14.5 | 87.0 |
| 27 other locomotives, Class 3 repairs @ 8.5 | 229.5 |
| Total used | 541.0 |

Excess pit time per month: $\frac{9 \text{ days} \times 8 \text{ hours}}{22 \text{ pits}}$ Equals 3.3 hours per pit per month for cleaning out pits between engines.

**The light machine bay from the platform in the turret lathe department**

**The large lye vats at tracks Nos. 24 and 25 in the erecting bay**

**The piston rod and crosshead group in the light machine bay—The erecting pits are shown in the background**

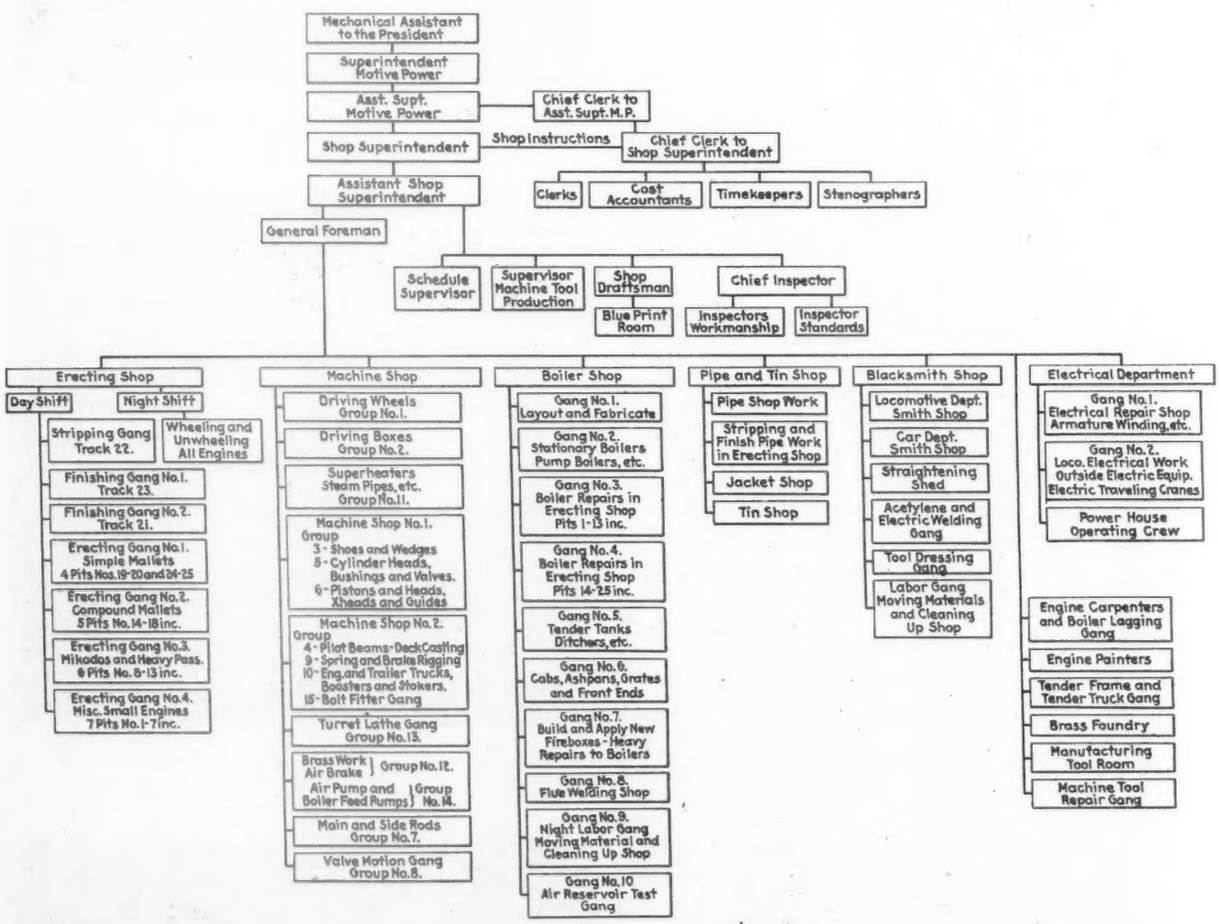
In order to assure a maximum output of 50 classified repairs per month of the class of locomotives described, each major operation on an average set of locomotive material must be completed in $\frac{200 \text{ hours}}{50 \text{ engines}} = 4$ hours. As will be seen in the subsequent descriptions of machine and erecting operations, each group and unit of the entire shop was designed and equipped to perform each major operation within the time required—namely, four hours.

### Shopping of Locomotives

Ninety days before locomotives are scheduled to be shopped for general repairs they are inspected and accompanying the formal request to the superintendent of motive power for authority to shop each locomotive is a statement of any unusual items of material required. These special material requirements are brought to the attention of the general storekeeper periodically so that materials which will be required on locomotive repair work may be procured in ample time before the locomotive is actually taken to the shop for repairs.

As previously mentioned, the Huntington shop is a combination of a longitudinal and transverse type of shop. On the center track of the longitudinal section of the shop certain progressive stripping operations are performed when the locomotive is taken into the shop. The locomotive then passes to the transverse section of the shop where it is unwheeled and assigned to a heavy repair pit where the major repair operations are performed. After these have been completed, the locomotive then returns to either one or the other of the outside tracks in the longitudinal section of the shop and eventually passes out of the shop on the same side where it entered.

In order to present a true picture of the manner in which this shop functions, the path of a locomotive will be traced through the entire repair operation. This description of the shop operation is based on the assumption that the maximum number of locomotives, namely 50 a month, are being repaired. Where conditions such as exist at present require that a lesser number of locomotives be handled, the unit time for the various operations is held as nearly as possible to the schedule as required for maximum output—the variation in output being taken care of by fluctuations in the number of shop-hours worked and the number of machines in operation.


Mechanical Assistant to the President
Superintendent Motive Power
Asst. Supt. Motive Power
Chief Clerk to Asst. Supt. M.P.
Shop Superintendent
Shop Instructions
Chief Clerk to Shop Superintendent
Assistant Shop Superintendent
Clerks
Cost Accountants
Timekeepers
Stenographers
General Foreman
Schedule Supervisor
Supervisor Machine Tool Production
Shop Draftsman
Blue Print Room
Chief Inspector
Inspectors Workmanship
Inspector Standards
Erecting Shop
Day Shift
Night Shift
Stripping Gang Track 22.
Wheeling and Unwheeling All Engines
Finishing Gang No.1. Track 23.
Finishing Gang No.2. Track 21.
Erecting Gang No.1. Simple Mallets 4 Pits Nos.19-20 and 24-25
Erecting Gang No.2. Compound Mallets 5 Pits No.14-18 inc.
Erecting Gang No.3. Mikados and Heavy Pass. 6 Pits No. 8-13 inc.
Erecting Gang No.4. Misc. Small Engines 7 Pits No.1-7 inc.
Machine Shop
Driving Wheels Group No.1.
Driving Boxes Group No.2.
Superheaters Steam Pipes, etc. Group No.11.
Machine Shop No.1. Group 3-Shoes and Wedges 5-Cylinder Heads, Bushings and Valves. 6-Pistons and Heads, Xheads and Guides
Machine Shop No.2. Group 4-Pilot Beams-Deck Casting 9-Spring and Brake Rigging 10-Eng. and Trailer Trucks, Boosters and Stokers. 15-Bolt Fitter Gang
Turret Lathe Gang Group No.13.
Brass Work Air Brake } Group No.12.
Air Pump and Boiler Feed Pumps } Group No.14.
Main and Side Rods Group No.7.
Valve Motion Gang Group No.8.
Boiler Shop
Gang No.1. Layout and Fabricate
Gang No.2. Stationary Boilers Pump Boilers, etc.
Gang No.3. Boiler Repairs in Erecting Shop Pits 1-13 inc.
Gang No.4. Boiler Repairs in Erecting Shop Pits 14-25 inc.
Gang No.5. Tender Tanks Ditchers, etc.
Gang No.6. Cabs, Ashpans, Grates and Front Ends
Gang No.7. Build and Apply New Fireboxes-Heavy Repairs to Boilers
Gang No.8. Flue Welding Shop
Gang No.9. Night Labor Gang Moving Material and Cleaning Up Shop
Gang No.10 Air Reservoir Test Gang
Pipe and Tin Shop
Pipe Shop Work
Stripping and Finish Pipe Work in Erecting Shop
Jacket Shop
Tin Shop
Blacksmith Shop
Locomotive Dept. Smith Shop
Car Dept. Smith Shop
Straightening Shed
Acetylene and Electric Welding Gang
Tool Dressing Gang
Labor Gang Moving Materials and Cleaning Up Shop
Electrical Department
Gang No.1. Electrical Repair Shop Armature Winding, etc.
Gang No.2. Loco. Electrical Work Outside Electric Equip. Electric Traveling Cranes
Power House Operating Crew
Engine Carpenters and Boiler Lagging Gang
Engine Painters
Tender Frame and Tender Truck Gang
Brass Foundry
Manufacturing Tool Room
Machine Tool Repair Gang

**Organization chart of the Huntington locomotive shops**

### How the Locomotives Are Handled

When the shops are turning out the maximum output of 50 locomotives a month (in 25 working days) two locomotives will be received at the shop each eight hours. The locomotives are despatched to the shops directly from road service and are usually received at the Huntington engine terminal under steam. After having the fires dumped, ash pans cleaned and the boiler

blown down and drained a yard crew spots the engines on the main shop lead, headed east, at position *A*. (This and other positions in the description of the operations indicated by letters are shown on the large drawing of the entire shop layout.) The main shop forces take charge at this point and wash out the front end, ash pan and firebox.

From the main lead the locomotives pass to position *B* on track No. 22 in the longitudinal section of the shop. Here the tender is disconnected and, with a storage-battery electric locomotive used around the shops, is switched back out of the shop on lead track 22 to track 26 where there is located a coal transfer conveyor. Here the coal remaining in the tender is removed and stored for use on outgoing locomotives. An ingenious device consisting of an electric motor with suitable reduction gear box mounted on a standard-gage shop truck is used for operating the stoker conveyor screws on tenders so equipped. In this manner the hand shovelling of coal from tenders into the conveyor pit is eliminated. The tender is then switched through track 28 to the east side of the tank shop and placed on the storage tracks until it is scheduled into the shop for repairs. Inbound tenders pass through the sand-blast house on track 30 and are handled onto the transfer table by means of a transfer-table cable puller. They are then moved into the tank shop in track 22 by means of an electric winch. Outbound tenders are finished and painted on tank shop tracks 23, 24 and 25 and when finished are stored on yard track 27 until called for. When the locomotive to which a tender belongs is completed the tender passes to the coal transfer conveyor and receives sufficient coal to fire up the locomotive.

### Inbound Inspection and Stripping

As soon as locomotives are delivered on the lead track at position *A* the main shop inspector makes a thorough examination to ascertain the material that will be needed to make the repairs. He checks his inspection report against the report of the master mechanic sent in when the locomotive was ordered to the shop for repairs and makes a special report of any missing parts that may have been taken from the engine before it was sent to the shop. These, if any, are charged against the operating division from which the engine was sent.

The locomotive is then moved to position *B* on track 22 in the shop, where the stripping gang removes all pipes, gages and boiler mountings. This operation is performed within a four-hour period.

In position *C* to which the locomotive is next moved, the jacket is removed from the boiler if necessary. In this position and main and side rods and motion work are removed. All of the operations in position *C* are completed within a four-hour period, completing the first eight-hour day that the locomotive is in the shop. On the second shop day the locomotive is moved to position *D* where, within a four-hour period, the lagging is removed if necessary and all pipes under the jacket which may have to be removed are taken out. The operations in this position require a four-hour period. In position *E* the next move, the air pumps, power reverse gear, fire door and feedwater-heater pumps are removed and deposited in front of a monorail hoist marked *S* from which they are delivered to a storage rack outside of the shop by means of an electric trolley on the monorail. In this position the cab is loosened up, the pedestal binders are loosened so they may be dropped quickly at the proper time and the stoker loosened up preparatory to its removal. The time allowed for all of the operations in position *E* is four hours, completing the second eight-hour day that the locomotive is in the shop.

From the shop layout diagram, it will be noted that the departments in the shop which are adjacent to the longitudinal stripping and refinishing tracks are those departments which are directly concerned with the repair work on the parts removed and replaced in these several positions. For example, in position *B* the pipe work is removed and the pipe shop is immediately adjacent to that position. In position *C* the rods and motion work are taken off. The rod and motion work repair group is located adjacent to position *C*. In position *E* the air pumps, fire doors, feedwater heaters, etc., are removed. The air pump and pneumatic devices repair group is located here while directly above these stripping tracks, on the second floor, is located the brass room where gages and boiler mountings, etc., are repaired.

After leaving position *E* the locomotive is placed on position *F* on track 22. It is in moving from position *E* to *F* that the locomotive passes from the longitudinal section of the shop to the transverse section and on being placed on position *F* in the main erecting shop the locomotive is lifted by means of the 250-ton crane and, after wheels and binders have been dropped, is moved to its assigned pit for heavy repairs. All of the movements in the longitudinal section of the shop are handled by an electric winch located between tracks 22 and 23 on the east side of the main erecting bay. As soon as the locomotive has been unwheeled in position *F* the wheels are moved eastward on track 22 into the wheel shop bay from which point they are handled by the crane to the proper repair group in that bay.

After the locomotive has been placed upon its assigned pit for heavy repairs, the first eight-hour period is taken up by the removal of all of the parts not previously taken off during preliminary stripping operations and by a minute examination of all cylinder bushings, valve chamber bushings, main frames and boiler to determine the exact extent and nature of repairs required.

### Assignment of Pits

In the erecting shop there are four gangs assigned with a view to equalizing, as far as possible, the total number of employees to be supervised as related to the type of locomotive to be handled. Gang No. 1 is assigned to the repair work on the heaviest Mallet locomotives on erecting pits Nos. 19, 20, 24 and 25. Gang No. 2 is assigned to the repair of a lighter series of compound Mallet locomotives on pits Nos. 14 to 18 inclusive. Gang No. 3 looks after the repairs to the Mikado type and heavy passenger locomotives on pits Nos. 8 to 13 inclusive, while gang No. 4 is assigned to repairs on miscellaneous types of smaller locomotives on pits Nos. 1 to 7 inclusive. The remaining pits in the erecting shop are used for progressive operations as follows: Pit No. 22 (inbound) for the unwheeling of all types of locomotives; Pit No. 23 (outbound) is confined to Mallet locomotives first, filling out with Mikado type locomotives to keep this track in continuous operation on wheeling and valve setting with a maximum time allowance of eight hours per locomotive; Pit No. 21 (outbound) handles all locomotives not taken care of on pit 23.

### Erecting-Shop Work

The work of stripping locomotives on track No. 22 from positions *B* to *F* and the unwheeling of locomo-

tives preparatory to delivery to the assigned working pit is under the supervision of a stripping foreman. It is his duty to see that all work scheduled for the several positions is performed in those positions in the time allowed. While a locomotive is in the erecting shop the four foremen of the gangs previously mentioned are responsible for the completion on schedule time of the repairs on each locomotive under their supervision. It is the duty of these foremen to see that the pedestal binders are properly fitted, that the spring and brake rigging is erected at the proper time, that the shoes and wedges are laid off properly and that information is extended on special forms provided for the purpose, to the driving-box gang so that the driving boxes may be machined, fitted to the driving wheels and delivered to the erecting shop at the scheduled time. These supervisors in the erecting shop are also responsible for the boring of the cylinder and valve bushings in accordance with standard practice and must see that boilers are made ready for water tests in accordance with the schedule, working with the foremen supervising other crafts which may have to work on each engine in the erecting shop.

### Machine-Shop Work

Sufficient machine tool equipment has been provided in the Huntington shop to turn out 50 locomotives a month of the classes mentioned. The machinery operations are divided into groups as follows:

Group 1—Driving wheels, trailer-truck wheels, axles and crank pins
Group 2—Driving boxes
Group 3—Shoes and wedges
Group 4—Frames, pilot beams, deck castings, etc.
Group 5—Cylinder heads, cylinder bushings, steam-chest valves, bushings, and covers
Group 6—Piston and rods, cross heads and guides
Group 7—Main and side rods
Group 8—Valve motion, except power reverse gear and reverse levers
Group 9—Spring and brake rigging
Group 10—Engine trucks, trailer trucks, boosters and stokers
Group 11—Steam and exhaust pipes, superheaters, feedwater heater drums
Group 12—Brass work, cab and boiler mountings, air brakes, except air pumps
Group 13—Turret-lathe work
Group 14—Air pumps, boiler feed pumps and pneumatic devices
Group 15—Bolts and pins
Group 16—Drifting valves, intercepting and by-pass valves, reverse and throttle levers and cylinder-cock rigging
Group 17—Miscellaneous work—fitting binders, braces, etc., with steam hammer and adjusting machine
Group 18—Electric repair shop
Group 19—Manufacturing tool room
Group 20—Machine-tool repair gang

The machine tools and special units of shop equipment in the various groups, together with detailed information concerning their operation will be made the subject of a special article and will, therefore, not be included in this article.

### Boiler-Shop Operations

The boiler shop at Huntington was built new in 1926. It has a capacity of nine or ten fireboxes a month and suitable facilities for overhauling 50 locomotive tenders per month. The tenders are switched to the east side of the yard and placed on tracks 29, 30, 31 and 32, track 30 being the inbound approach to the sand-blast house. The tenders are scheduled into the shop in the order in which they are to be turned out. On track 30 they pass through the sand-blast house where the exterior of the tank as well as the coal space is sand blasted. Immediately upon the completion of the sand-blasting operation, the tenders are given a priming coat of paint to prevent the surfaces from rusting. The tenders are then pulled out of the sand-blast house onto the transfer table and delivered in the shop on track 22 where the tender tanks are removed from all rectangular tank type tenders. On Vanderbilt type tenders the tank and frame is lifted off the trucks and placed in position on the repair rack where all tenders are water tested, given the necessary repairs and again water tested before completion and final passing of the work.

While this work is being performed, the trucks are being overhauled and tender frames are given necessary repairs, including new decking where it is required. Entire tanks are assembled on tracks 34 and 35 where they are painted, lettered and varnished. Before completion of the repairs, they are taken out of the shops onto the transfer table and placed on yard track 27 for storage until required. Every effort is made to switch the tenders out of the shop in the order in which they will be required in order to avoid any further or unnecessary handling.

### Outbound Progressive Positions

After the completion of the heavy repair work in the main erecting shop, the locomotive is returned to pits 21 and 23 which are held open for the first of the progressive positions in the final finishing of the locomotive. To track 23, or position *H*, are assigned Mallet locomotives and heavy Mikados. In this position, the two units of the Mallet engine are again connected, valves are set and the engine is made ready to move in the progressive line. This operation requires eight hours. In the next progressive position *I* on track 23, the lagging is applied to the boiler. This operation requires another eight hours. The jacket is applied in position *J* and the time required is eight hours. In position *K* all of the pipe work is completed within an eight-hour period. When a locomotive moves to position *L*, the final position in the shop, the tender is taken from the west end of yard storage track 27, sufficient coal for firing up being placed in the tender at the coal-transfer conveyor and the tender switched through lead track 23 to position *L* in the shop where it is coupled onto the locomotive. The locomotive is then filled with hot water from the boiler washing plant and steam from the power house at 150-lb. pressure. Adjacent to this position on tracks 23 and 21 are located Locoblow exhaust hoods and blowers. The locomotive is fired up in the shop and the pressure run up to the working pressure. The safety valves are then set and the locomotive is run out of the shop under its own steam for a trial trip of 30 min. to an hour, upon return from which it is placed again in position *L* for final adjustment for releasing for service at the end of that working day.

When a locomotive is completed in position *L* and released for service, the locomotives in positions *K*, *J*, *I* and *H* are coupled together by suitable connections and the released engine on backing out of the position moves these other locomotives into the next progressive position, leaving the space on erecting shop position *H* open for the delivery of another locomotive to that position for the following day's work.

The purpose of placing all of the large locomotives in the progressive line on track 23 is to put these locomotives next to the pipe and tin shop so as to reduce the amount of handling of materials from these departments to the locomotive.

The smaller classes of locomotives are handled on track 21, working through positions *M*, *N*, *O*, *P*, and *Q* in the same manner as described for positions *H* to *L* inclusive on track 23.

Positive instructions are issued that when locomotives are released from the final positions on tracks 23 and 21 in the main shop, they must be complete and ready for service so as not to require any further adjustments in the enginehouse or train yard.

# Layouts of Locomotives On Curves*

By R. F. Hall

**The use of unequal scale diagrams in laying out locomotives on curved track to determine if their wheel base arrangements will permit them to pass around curves of a given radius—Part II**

THE preceding portion of this study dealt, to a large extent, with methods of laying out locomotives on curved track lines and the errors involved in approximations. In this part of the article, diagrams which appear to be preferable to the Roy diagram are described and their application to actual cases is shown.

The Roy diagram is usually laid out to show both rail lines by concentric circular arcs spaced apart radially a distance equal to the sum of the clearances (either full size or a reduced scale) which are thus assumed as being equal at all wheels. This assumption, at least in the case of American locomotives, is usually invalid. The wheel spacings of the rigid wheel base are laid off on a straight line to the proper horizontal scale. This line is then adjusted with relation to the curved rail lines, the condition of the wheel base passing the curve being met when none of the wheel-position points lies outside the space between the curved lines representing the rails. The relation of these points to the curves is also assumed to show the relation of the wheels to the inner and outer rails. Radial trucks are swung about their radius-bar centers to position them in the curve and, as previously pointed out, this may lead to serious error, due to the difference in the vertical and horizontal scales.

A diagram which avoids the principal errors of the Roy is shown in Fig. 4. This is also of European origin.

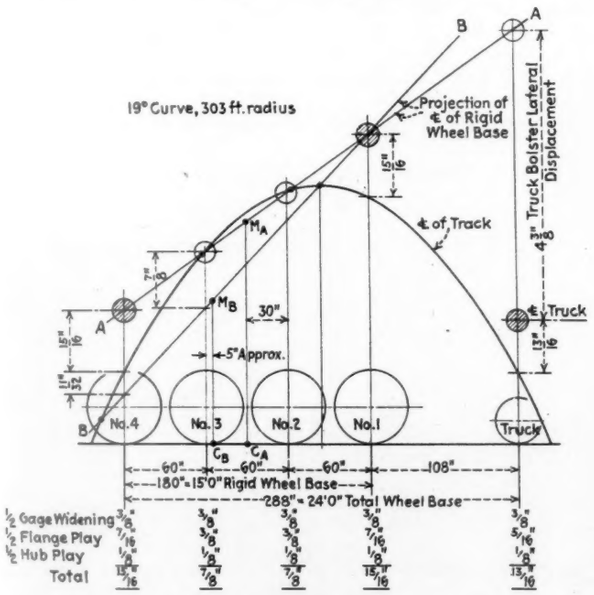



**Fig. 4—Layout diagram in which the vertical scale may be full size or any convenient proportion, independently of the horizontal scale**

It employs a single curved line which represents the center line of the track. This line is laid out in a similar manner to that shown in Fig. 1, (see Part I which was published in the March issue) except that the horizontal scale is reduced in order to conserve space and the vertical scale may be full size or any other convenient proportion, independently of the horizontal scale. The resulting curve approximates an ellipse, the equation to which is:

$$\left(\frac{X}{\frac{R}{h}}\right)^2 + \left(\frac{Y}{\frac{R}{v}}\right)^2 = 1$$

$$Y = \frac{1}{v}\sqrt{R^2 - (hX)^2} \quad \ldots\ldots\ldots\ldots (15)$$

in which $X$ originates at the major (vertical) axis and $Y$ originates at the minor axis. All dimensions are in the same unit.

$R$ = curve radius, in feet

$\frac{1}{h}$ = horizontal scale

$\frac{1}{v}$ = vertical scale.

It should be noted that $X$ and $Y$ are actual *diagram* and not *track* dimensions.

If the curve is laid out from the equation, it will be found more convenient (on account of the remoteness of the minor axis) to lay off the ordinates from the tangent normal to the major axis. These ordinates will then be:

$$O = 12\left(\frac{R}{v} - Y\right) = \frac{D}{v} \quad \ldots\ldots\ldots\ldots (16)$$

where O = ordinate, in inches
D = tangent deflection, in inches

The most practical method of laying out the curve, however, is that first given.

An important advantage of a curve thus obtained is that the error due to the use of an approximate formula

* Part I of this article was published in the March issue of the *Railway Mechanical Engineer*.

for deflections is the same as if all scales were equal and is, therefore, in most cases negligible.

In using the diagram all clearance measurements are made along vertical lines through the wheel positions and normal to the tangent to the curve at its vertical axis of symmetry. This is a most important feature and is equivalent to assuming that parts shifted obliquely between the rails, or which are rotated about a center, do not alter their fore and aft relation to the rails. That the above assumption is substantially correct (within limits) and does not involve undue error will

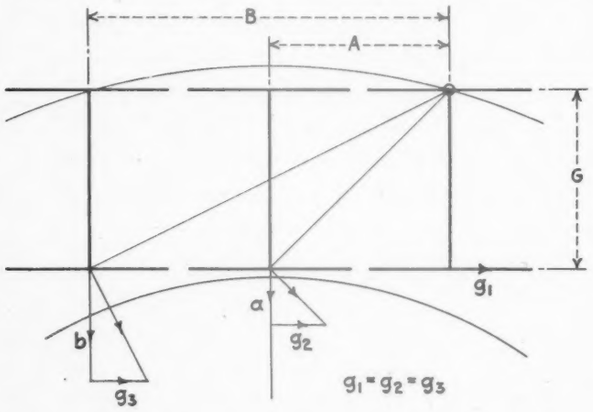



**Fig. 5—Showing that a small movement of any wheel about one of the others as a center gives a common angular movement to the whole wheel base**

be apparent from a study of Fig. 5 where it is shown that a small movement at any wheel about one of the others as a center gives a common angular movement to the whole wheel base and approximately equal horizontal displacements at each wheel on the side opposite the center of rotation. The effect on the deflection of this difference between the true and apparent wheel positions depends upon the length of the chord, for the vertical direction component of a point on the curve increases with its distance from a given vertical axis. The maximum error in the case shown is evidently at the first and third wheels, being minus at the first and plus at the third. But the longer the wheel base and the sharper the curve the less will be the capacity for angular movement between the rails, which tends to limit the error. At the ends of a 20-ft. chord on a 30-deg. curve (193 ft. radius) the difference in deflection per inch of horizontal movement is 0.05 in., or 1.6 per cent of the deflection. A bolster center displaced laterally 10 in. on a 60-in. radius moves back horizontally only 0.84 in. from its central position.

To position the horizontal center line of the rigid wheel base it is necessary to fix two points on it, which is done in the case of line *A-A*, Fig. 4, by assuming that the first and fourth wheels flange the outer rail. At each of these wheels, then, one-half of the total clearance (15/16 in.) is laid off on their center lines above the curve line, representing a movement toward the outside rail of that amount. Line *A-A* passing through these two points represents the center line of the rigid wheel base and this line, due to the symmetrical movement of the wheel base toward the outer rail, is parallel to its original position with the clearances on both sides equally divided. In general, this line shows the relation of the center lines of the wheel base and the track to each other and when its intersection with a vertical center line through an axle is above the track center line an amount equal to one-half the sum of the clearances at that axle contact of the outer wheel with the rail is shown, while if the intersection lies below the track center line an equal amount, contact of the inner wheel is shown. As commonly used, contact is indicated by shaded circles at the intersections, as in Fig. 4. Line *B-B* shows the conditions when the first outer and the third inner drivers flange their adjacent rails. In this case, the fourth inner driver clears the rail by the amount 7/8 in. — 11/32 in. = 17/32 in. Lines *A-A* and *B-B* thus measure off vertical displacements proportional to the horizontal distances of the different wheels from an assumed center of rotation, the position of this center being first established by direct measurement.

As with the circular arc, the horizontal relation of the wheel base to the vertical axis of symmetry of the curve is unimportant and it will be seen in Fig. 4 that the rigid wheel base has been offset from that axis in order to make the diagram more compact.

Similarly, a line intersecting the curve at two points (or any line parallel to such a line) is normal to the radius of the curve at a point midway between the two intersections. This suggests a means of locating the "friction center" or instantaneous center of the friction forces set up at the wheel treads by the slipping necessary to suit the continuous change of direction of the curve. The geometrical location of this center is at the point on the horizontal center line of the wheel base where a radius line from the center of the curve is normal to that center line. With a given angular position of the wheel base between the rails, its center line is bisected between the two points at which it intersects the curve line, and this mid-point is projected vertically to the horizontal base line as in Fig. 4. The position of the "friction center" ($C_A$, $C_B$) with relation to the wheel-base length is thus established. If the wheel-base center line does not intersect the curve in two points, a line parellel to it is drawn which does so intersect and used instead.

The lateral displacement of the leading or trailing

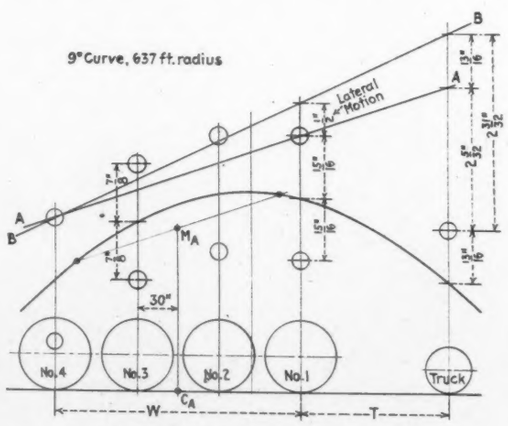



**Fig. 6—The author's modification of the diagram shown in Fig. 4**

trucks is also readily obtained from the diagram, all clearances from the outer rail at the truck being assumed as taken up and thus deducted from the distance between the engine center line and the curve, as shown.

It will be observed that the diagram just described does not give directly the relations between the wheels and rails, but requires an intermediate step, as in the

case of the fourth inner driver located by line *B-B* of Fig. 4. Where the clearances are equal at all wheels, as in the Roy diagram, this extra step could be avoided by drawing two elliptical curve lines spaced apart vertically a distance equal to the common total clearance. These lines would be duplicates of each other and equivalent to the center line of the curve. This accords with the practice of bending both rails to the radius of the center of the track. The vertical spacing between them would be equal at all points. A straight line positioned between these curves would then show directly the relation of the wheels to the rails, by means of the intersections of this line with vertical lines through the wheel positions.

The clearances at all wheels, however, are seldom equal, and it is thought that the author's modification of the diagram in Fig. 4 will be found more generally useful and convenient. Fig. 6 illustrates the modified diagram. In this diagram a single curve line represents the center line of the track, as before. Above and below this curve, on the vertical center lines of the wheels, the half clearances are laid off, their limits being indicated by small circles or otherwise. The clearances are thus established completely at the outset and the relation of the wheel-base center line to these limit points shows directly the relations of the wheels to the rails on either side. At the trucks it will usually be sufficient to indicate the clearance limit above the curve line only. Fig. 6 also shows the increase in truck lateral displacement due to the use of a lateral-motion device having ½ in. play each side of the center at the first pair of drivers. Although the layout may be used to obtain the truck displacement, it will generally require less time (if this is the only information desired from the diagram) to calculate it by means of the following formula:

$$S = \frac{.0417T\ (W+T)}{R} + L\,\frac{W+T}{W} \quad \ldots\ (16)$$

where

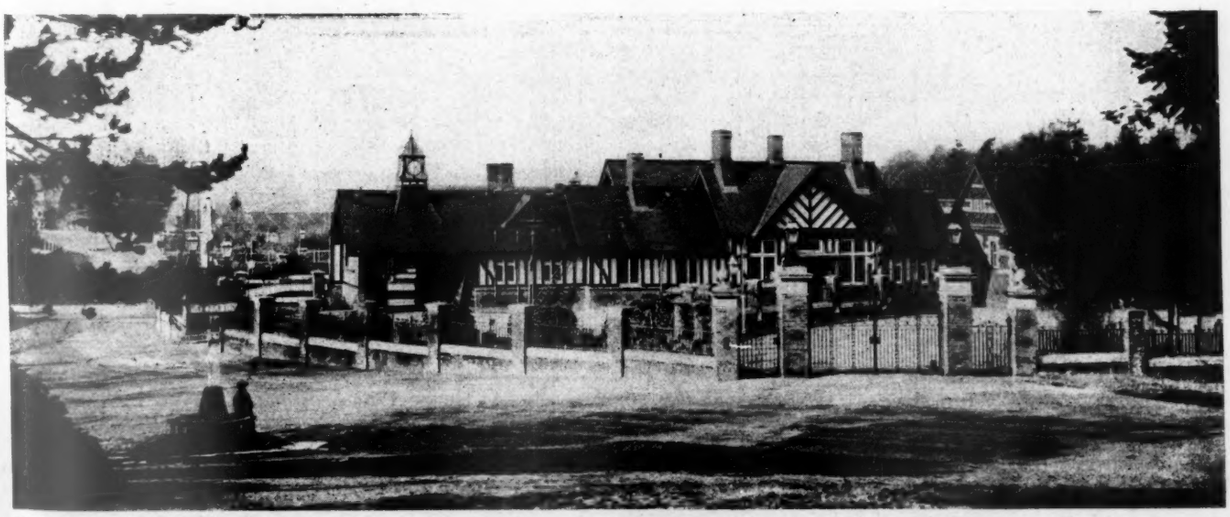
S = truck lateral displacement, in inches
W = rigid wheel base, in inches
T = distance from adjacent driver to truck, in inches
R = radius of maximum curve, in feet
L = lateral motion (each side of center) at adjacent driver, in inches

The first term of the right-hand member is based on the wheel position of line *A-A* in Figs. 4 and 6, while the second term gives the proportionate effect at the truck of the lateral motion at the drivers adjacent to the truck. It can readily be seen that if the rear portion of the rigid wheel base trails toward the inner rail, the truck displacement will thereby be increased, but on the maximum curve which the engine is designed to pass the clearances will be well taken up by the effect of the curvature and the capacity for movement toward the inner rail will be greatly limited. It is customary, therefore, to neglect this effect and also that of the differences in clearances at drivers and truck, and to calculate the displacement, making the actual capacity of the truck for bolster side movement at least equal to the next multiple of ¼ in. greater than the calculated figure.

It may be well to clarify here the statement made above that the relation of the wheel-base center line to the clearance-limit points in Fig. 6 shows directly the relation of the wheels and rails. When the center line passes through a limit point on either side, all the clearances are taken up on that side, including that between the hub and box, but this latter movement is effected by sliding the boxes across the axle and does not move the wheels and axle. Therefore, when all clearances at one wheel are taken up, the flange contact of the opposite wheel clears its rail by the sum of the total gage widening and flange clearance. The *effective* clearance, however, includes also the total hub play, which is then all on one side and the diagram shows the sum of these three clearances as available for center-line movement. This distinction is generally unimportant when the layout is made to determine the possible positions which the engine can assume between the rails, but has considerable influence in flange-pressure calculations.

In conclusion, attention should be called to the desirability of choosing as large a horizontal scale as consistent with a convenient size of layout. It may also be found preferable, in some cases, to make the vertical scale one-half size. The independence of the scales in this form of diagram greatly facilitates their choice.

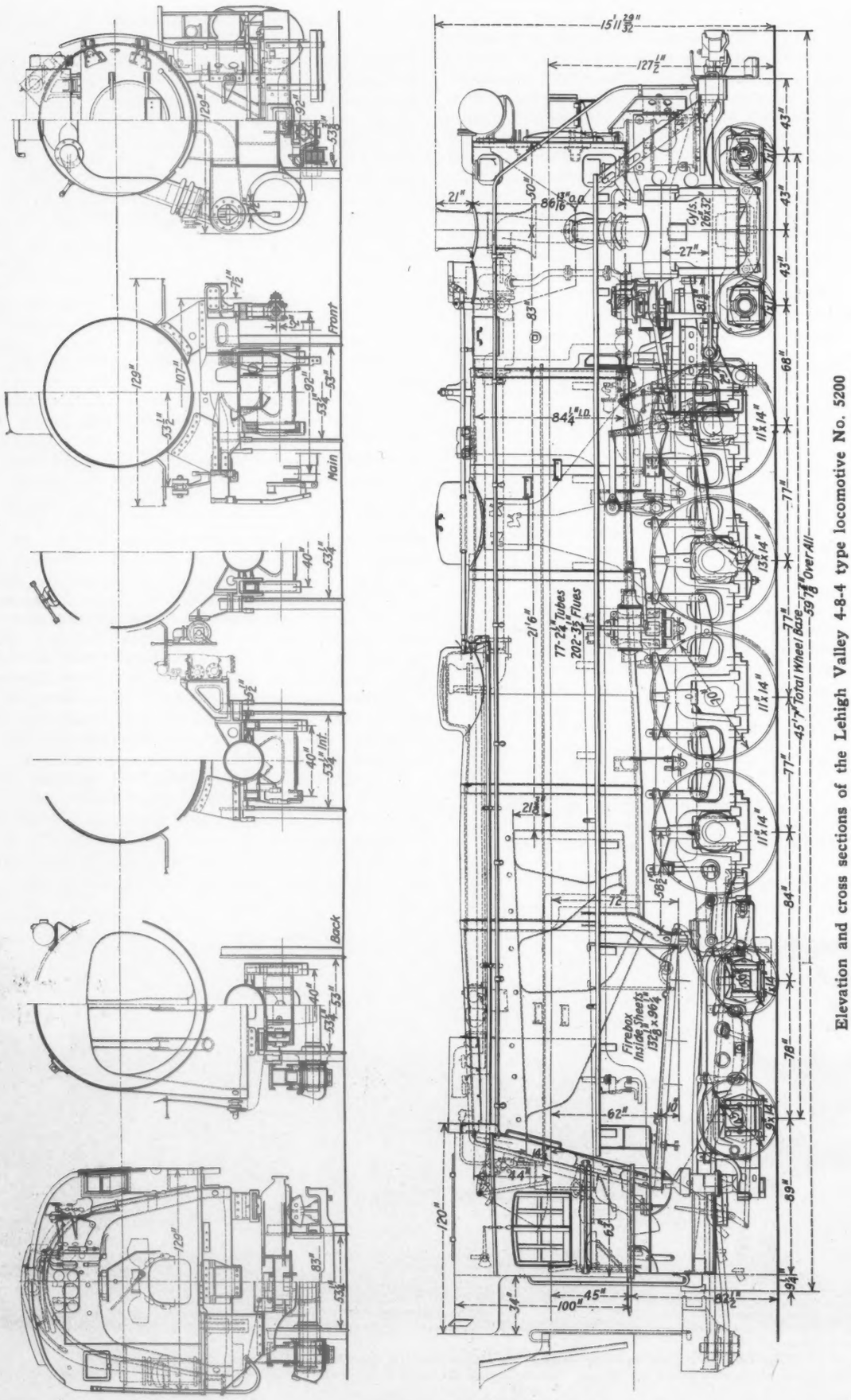
* * *



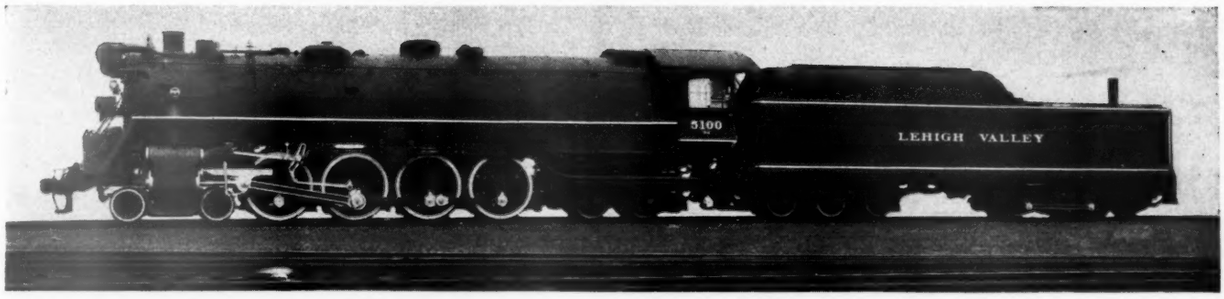
*Underwood & Underwood*

**King George's own railway station at Wolferson on the Royal Estate at Sandringham**

The crown and royal coat of arms surmount the station lamps and a suite of rooms is in reserve for the royal family of Great Britain at all times




Elevation and cross sections of the Lehigh Valley 4-8-4 type locomotive No. 5200




*Left side of 4-8-4 type locomotive built for the Lehigh Valley by The Baldwin Locomotive Works*

# Two Freight Locomotives Designed for Fast Service

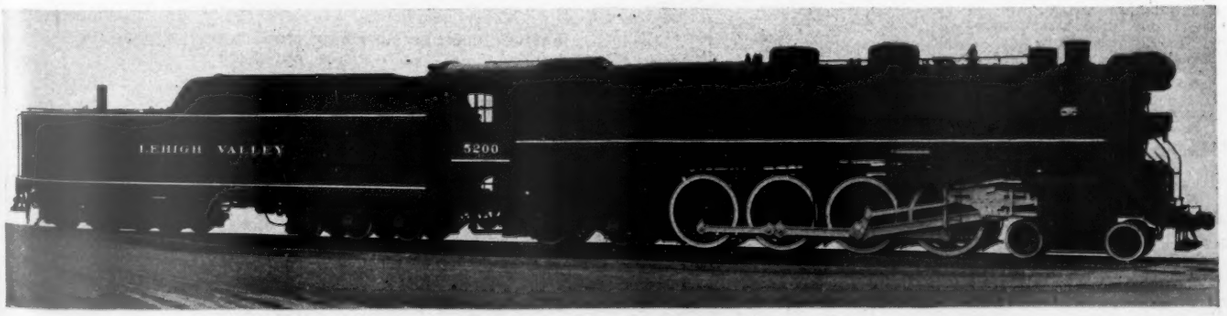
**Lehigh Valley buys two 4-8-4 type locomotives for use in fast-freight service between the Niagara frontier and tidewater —Tractive force over 66,000 lb.—To haul 3,000-ton trains with minimum pusher service**

TWO 4-8-4 type locomotives were delivered to the Lehigh Valley during the last week in March for operation in fast-freight service between the Canadian frontier and tidewater at Jersey City, N. J. During the week in which the locomotives were delivered, they were exhibited at different towns and cities along the line, and attracted considerable interest. Over 10,000 persons inspected the locomotives while they were on exhibition at Wilkes-Barre, Pa., and there were only a few points where the locomotives were exhibited that the attendance was less than 2,000.

Locomotive No. 5100, road class T-1, was built by the Baldwin Locomotive Works, and locomotive No. 5200, road class T-2, was built by the American Locomotive Company. The former has a rated maximum tractive force of 66,400 lb. and 27-in. by 30-in. cylinders, while the latter exerts a rated maximum tractive force of 66,700 lb. and has 26-in. by 32-in. cylinders. Both locomotives are equipped with Bethlehem auxiliary locomotives which have a rated tractive force estimated at 18,360 lb. This gives a starting tractive force for the No. 5100 of 84,760 lb., and 85,060 lb. for the No. 5200. Both locomotives have 70-in. drivers. The No. 5100 operates at a boiler pressure of 250 lb. and the No. 5200 at a pressure of 255 lb. They are designed to traverse curves of 18 deg.

The locomotives were designed by the builders to meet the special requirements of the railroad for handling merchandise trains in fast-freight service. It was desired to operate the locomotives from Sayre, Pa., to Buffalo, N. Y., from Buffalo to Jersey City, N. J. and back to Sayre, and haul 3,000-ton trains with a minimum of helper service. With the new power, helper service is only required on the Mountain cut-off, near Wilkes-Barre, Pa., where there is a long ascending grade of 1.14 per cent.

It will be noted from the table showing the principle weights and dimensions that the two locomotives are somewhat different with respect to essential features in design to secure approximately the same tractive force within the weight limitations. On the other hand, the general appearance and construction of the two locomotives are essentially the same. Both have welded tenders and cabs. The crown and side sheets of the firebox are in three pieces, with the throat, flue sheet, door sheet and combustion chamber completely welded. The boilers, which are of nickel steel, have Type E superheaters and Elesco feedwater heaters with C. F.

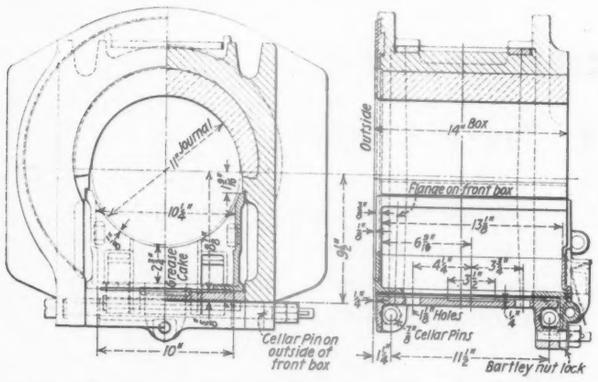



**Lehigh Valley 4-8-4 type locomotive built by the American Locomotive Company**

pumps. Other special equipment includes Standard type BK stokers, Ragonnet Type E power reverse gears and Commonwealth one-piece bed castings in which are included the cylinders and air reservoirs. Commonwealth front and rear engine trucks are used, the front truck being equipped with SKF roller bearings.

**Principal Dimensions, Weights and Proportions of The Lehigh Valley 4-8-4 Type Locomotives**

| | | |
|---|---|---|
| Railroad | Lehigh Valley | |
| Builders | Baldwin Locomotive Works | American Locomotive Company |
| Type of locomotive | 4-8-4 | 4-8-4 |
| Road number | 5100 | 5200 |
| Road class | T-1 | T-2 |
| Service | Fast freight | |
| Cylinders, diam. and stroke | 27 in. by 30 in. | 26 in. by 32 in. |
| Valve gear, type | Walschaert | Baker |




**Driving box arrangement on locomotive No. 5200—Grease cakes are renewed through the spring lid on the inside end**

| | | |
|---|---|---|
| Valves, piston type, size | 12 in. | 12 in. |
| Maximum travel | 7½ in. | 8⅝ in. |
| Outside lap | 1⅜ in. | 1⅜ in. |
| Exhaust clearance | ⅛ in. | L. and L. |
| Lead in full gear | ¼ in. | ¼ in. |
| Weights in working order: | | |
| On drivers | 270,000 lb. | 268,000 lb. |
| On front truck | 55,000 lb. | 65,200 lb. |
| On trailing truck | 83,000 lb. | 88,800 lb. |
| Total engine | 408,000 lb. | 422,000 lb. |
| Total tender | 366,200 lb. | 358,800 lb. |
| Total engine and tender | 774,200 lb. | 780,800 lb. |
| Wheel bases: | | |
| Driving | 19 ft. 3 in. | 19 ft. 3 in. |
| Rigid | 12 ft. 10 in. | 12 ft. 10 in. |
| Total Engine | 45 ft. 1 in. | 45 ft. 7 in. |
| Engine and Tender | 94 ft. 10½ in. | 95 ft. 5½ in. |
| Wheels, diameter outside tires: | | |
| Driving | 70 in. | 70 in. |
| Front truck | 33 in. | 33 in. |
| Trailing truck, front | 42 in. | 36 in. |
| Trailing truck, back | 42 in. | 45 in. |
| Journals, diameter and length: | | |
| Driving, main | 13 in. by 14 in. | 13 in. by 14 in. |
| Driving, others | 11 in. by 14 in. | 11 in. by 14 in. |
| Front, truck | 7 in. by 14 in. | 7 in. by 12 in. |
| Trailing truck, front | 8 in. by 14 in. | 7 in. by 14 in. |
| Trailing truck, rear | 8 in. by 14 in. | 9 in. by 14 in. |
| Boiler: | | |
| Type | Straight top | |
| Steam pressure | 250 lb. | 255 lb. |
| Fuel, kind | Soft coal | |
| Diameter, front ring, inside | 86 in. | 84¼ in. |
| Firebox, length and width | 132⅛ in. by 96¼ in. | 132⅛ in. by 96¼ in. |
| Combustion chamber, length | 48 in. | 52 in. |
| Tubes, number and diam. | 77—2¼ in. | 77—2¼ in. |
| Flues, number and diam. | 202—3½ in. | 202—3½ in. |
| Length over tube sheets | 21 ft. 6 in. | 21 ft. 6 in. |
| Grate area | 88.3 sq. ft. | 88.3 sq. ft. |
| Heating surfaces: | | |
| Firebox and combustion chamber | 490 sq. ft. | 508 sq. ft. |
| Tubes and flues | 4,932 sq. ft. | 4,933 sq. ft. |
| Total evaporative | 5,422 sq. ft. | 5,441 sq. ft. |
| Superheating | 2,256 sq. ft. | 2,243 sq. ft. |
| Comb. evap. and superheat. | 7,678 sq. ft. | 7,684 sq. ft. |
| Tender: | | |
| Style | Rectangular | |
| Fuel capacity | 28 tons | 28 tons |
| Water capacity | 18,000 gal. | 18,000 gal. |
| Wheels, diam. outside tires | 36 in. | 36 in. |
| Journals, diam. and length, front truck | 6½ in. by 12 in. | 6½ in. by 12 in. |
| General data, estimated: | | |
| Rated tractive force | 66,400 lb. | 66,700 lb. |
| Tractive force, booster | 18,360 lb. | 18,360 lb. |
| Maximum tractive force, starting | 84,760 lb. | 85,060 lb. |
| Weight proportions: | | |
| Weight on drivers ÷ tractive force | 4.02 | 4.07 |
| Weight on driver ÷ total weight engine, per cent | 66.0 | 63.7 |
| Total weight engine ÷ comb. heat surface | 53.3 | 55 |
| Boiler proportions: | | |
| Tractive force ÷ comb. heat. surface | 8.64 | 8.68 |
| Tractive force × diam. drivers ÷ comb. heat. surface | 605 | 607 |
| Firebox heat. surface ÷ grate area | 5.55 | 5.77 |
| Firebox heat. surface, per cent of evap. heat. surface | 9.04 | 9.35 |
| Superheat. surface, per cent of evap. heat. surface | 41.6 | 41.6 |

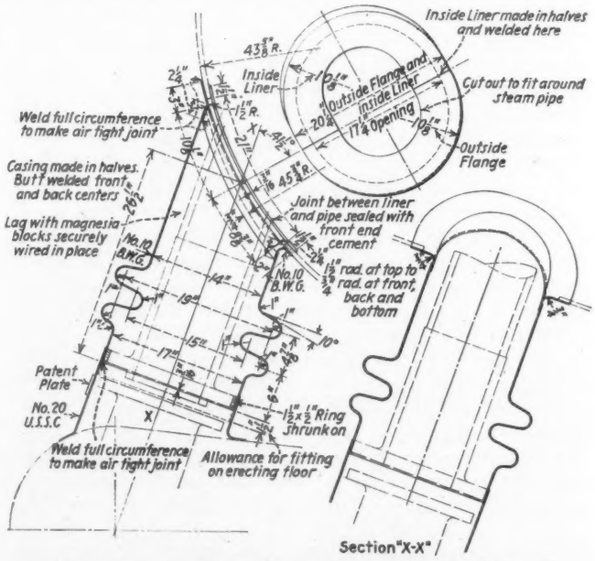
Steam distribution is obtained on the No. 5100 with a Walschaert valve gear and 12-in. valves, and on the No. 5200 with a Baker long-travel gear and valves of the same diameter. The main and side rods are of carbon-vanadium steel. The crossheads are underhung and, in the case of the No. 5100 work in multiple-bearing guides.

## Detail Design

The boiler shell and inside firebox of locomotive No. 5100 are constructed of nickel-steel plates. The seams are butt welded. Four Thermic syphons are applied, three in the firebox and one in the combustion chamber. Superheated steam is used for all the auxiliaries, including the auxiliary locomotive, except the whistle and blower.

Lateral-motion boxes are used on the leading drivers. Floating bushings for both main and side rods are used on the main crank pins.

Nickel-steel plates were also used for the boiler shell and inside firebox of locomotive No. 5200, and the same number and arrangement of Thermic syphons. Alco weldless-steel boiler braces were applied. A complete installation was made of the two-piece Flannery type flexible staybolts and radial stays, except for the first


Inside Liner made in halves and welded here
Inside Liner
Outside Flange and Inside Liner
Cut out to fit around steam pipe
Weld full circumference to make air tight joint
Outside Flange
Casing made in halves. Butt welded front and back centers
Joint between liner and pipe sealed with front end cement
Lag with magnesia blocks securely wired in place
No.10 B.W.G.
1" rad. at top to rad. at front, back and bottom
Patent Plate
No.20 U.S.S.C
1" 1" Ring Shrunk on
Weld full circumference to make air tight joint
Allowance for fitting on erecting floor
Section "X-X"

**Fetters corrugated steam-pipe casing applied on locomotive No. 5200**

row above the firebox ring and those stays directly back of obstructions, such as the grate side frame, fire-door frame, etc., which are hollow rigid bolts. The steam-pipe casing, shown in one of the drawings, is the Fetters corrugated steel-plate type.

The driving boxes on the No. 5200 are equipped with the Alco cast-steel cellar and spreader, arranged for Franklin lubrication. They are designed to facilitate the easy removal and renewal of grease cakes. Access to the cellar is had by means of a lid, which drops down. It is held shut by means of a flat spring. Reverse-gear

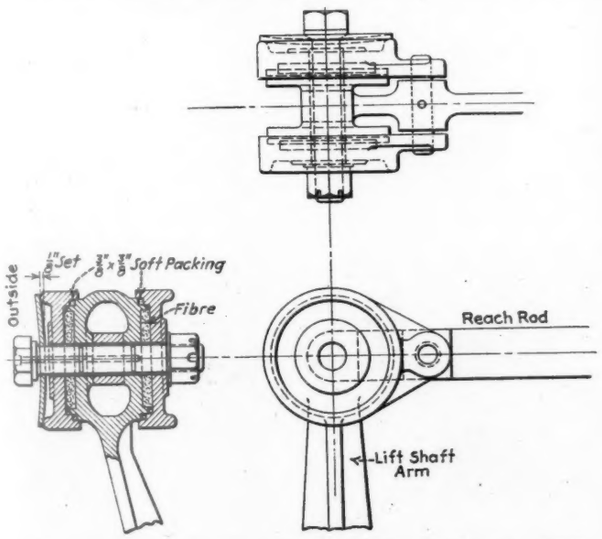
dampeners, shown in one of the drawings, are applied to dampen the shocks ordinarily produced in valve gears and which are transmitted to the reverse gear, tending to make the gear creep. This dampener is incorporated into the reach rod and lift-shaft arm connection, as shown. A compressed spring plate on the outside forces the pin connections against the fibre, which serves as the friction element to produce the dampening effect.

The reverse gear and feedwater pumps are supported by brackets attached to the bed casting, which eliminates studs in the shell of the boiler. The air reservoirs being cast integral with the bed casting also eliminates considerable piping from the right side of the locomotive.

The crossheads on the No. 5200 are of the Laird type fitted with the railroad's standard bronze shoes. The rods are equipped with solid bushings throughout except for the back end of the main and side rod connections which are of the floating type.

### Lubrication

Each locomotive is equipped with a Nathan type DV mechanical lubricator having 14 feeds and a capacity for 24 pints of oil. Two feeds run to the cylinder barrels, two feeds to the steam pipes and two to the guides.




**Reverse-gear dampener applied on locomotive No. 5200**

One feed extends to the air compressor, one to the stoker and one to the feedwater-heater pump. Four feeds run to the driving boxes and one to the atomizer which takes care of the throttle, booster and drifting valves. Dividers for splitting the feeds to the driving boxes are of the railroad's design.

The main crank pins and crosshead wrist pins are grease lubricated and Spee-D lubrication is applied to the back end of the eccentric rod. Oil lubrication is used for the front ends of the main rods.

Alemite grease fittings are applied to the motion work, spring rigging, center plates and chafing castings, gear housing for the stoker, front and back trailing-wheel hubs, end surfaces of the engine-truck bolster, engine- and trailing-truck pedestal surfaces, trailing-truck radius-bar fulcrum, throttle rigging and shoe and wedge surfaces of the driving boxes. The brake rigging has Alemite lubrication as follows: Bell crank at the brake shaft, top brake-hanger pins, brake-head pins, and brake beams at the hangers. The application of grease fittings to the valve gear do not extend beyond the reach-rod connection to the reverse gear.

The tenders have Commonwealth one-piece frames of the water-bottom type. The tanks are built with welded seams. The trucks are of six-wheel design, with the Bethlehem auxiliary locomotive applied to the two pairs

**List of Special Parts, Appliances and Equipment on the Lehigh Valley 4-8-4 Type Locomotives Built by the American Locomotive Company and the Baldwin Locomotive Works**

| | American | Baldwin |
|---|---|---|
| Railroad | Lehigh Valley | |
| Service | Fast freight | |
| Number built | One | One |
| Boiler and firebox: | | |
| Blower valve | Lunkenheimer | |
| Blower nozzle | T-Z | |
| Blow-off cocks | Everlasting | |
| Blow-off muffler | Okadee | |
| Boiler and firebox steel | Bethlehem, nickel steel | |
| Feedwater heater and pump | Elesco, type CF pump | |
| Fire brick | General Refractories | |
| Firebox plates | Bethlehem | |
| Firedoor | Franklin | |
| Flexible staybolts | Bethlehem iron, Flannery | |
| Flexible staybolt caps | Two-piece M.K. hollow copper coated | |
| Injectors | Hancock | |
| Lagging | Johns-Manville | |
| Lagging, pipes, cab, etc. | Superinsutape | |
| Safety valves | Consolidated | |
| Smokebox hinges | Okadee | |
| Smokebox netting | Draftac, No. 393 | |
| Staybolts, rigid hollow | Ulster | |
| Staybolt sleeves | Flannery | |
| Staybolts, solid | Bethlehem iron, Flannery | ——— |
| Steam pipe casing | Fetters | |
| Stoker | Standard, type BK | |
| Superheater | Type E | |
| Superheater pipes | Pittsburgh Steel Products | National Tube Co. |
| Syphons | Nicholson Thermic | |
| Throttle | Bradford | |
| Tubes and flues | Pittsburgh Steel Products | National Tube Co. |
| Washout plugs | Housley | |
| Water column | Nathan | |
| Water glass | Nathan (Delco) | |
| Whistle | Hancock | |
| Whistle operator | Viloco | |
| Cylinders and running gear: | | |
| Auxiliary locomotive | Bethlehem, rear tender truck | |
| Bed frame | General Steel Castings | |
| Crank pins | Hammered O.H. steel | |
| Connecting rods | Carbon-vanadium alloy | |
| Crosshead shoes | Lehigh Valley, bronze | Pennsylvania type |
| Cylinder and valve bushings | Hunt-Spiller | |
| Cylinder cocks | Ardco, air-operated | |
| Cylinder lubricator | Nathan, mechanical type D-V | |
| Cylinder and valve packing | Hunt-Spiller | |
| Drifting valve | Ardco, automatic 7-C-2 | |
| Driving axles | Hammered O.H. steel | |
| Driving box, lateral motion | Franklin | |
| Driving box cellars and spreaders | Alco | Franklin |
| Driving box lubricator | Nathan, mechanical type D-V | Franklin |
| Driving tires | Midvale | |
| Engine truck frame | General Steel Castings | |
| Engine truck roller bearings | SKF | |
| Engine truck wheels | Bethlehem | Standard Steel |
| Frame pedestal wedges | Franklin | |
| Grease cups, side rods | Spee-D | |
| Guides | Alco | Pennsylvania type |
| Lubricator fittings, grease | Alemite | |
| Packing, metallic | King type | |
| Piston heads | Cast steel, Z type. R.R. standard | |
| Piston rods | Hammered steel | |
| Piston packing and bull rings | Hunt-Spiller | |
| Reverse gear | Ragonnet, type E | |
| Rod bushings, external | Hunt-Spiller | |
| Springs | Railway Steel Spring | |
| Spring material, engine truck | Silico-manganese steel | ——— |
| Trailing truck equalizer fulcrum block | Townsend | ——— |
| Trailing truck frame | General Steel Castings | (Delta) |
| Trailing truck wheels, front | Carnegie | Standard |
| Valve gear | Baker, long travel | Walschaert |
| Valve, aux.-loco | Lunkenheimer | |
| Valves, miscellaneous | Ohio Valve | |
| Cab and miscellaneous: | | |
| Air brakes | Westinghouse, E.T. No. 6 | |
| Air signal | Westinghouse, Schedule L | |
| Bell ringer | Transportation Devices | |
| Brake, foundation | American | |
| Brake shoes, driver | American Brake Shoe & Fdry. | |
| Brake valve, pedestal | Westinghouse | |
| Bumper, front | General Steel Castings | |
| Cab apron | General Steel Castings | Alan Wood & Co. |
| Cab windows | Prime | |
| Cab windshield | Prime | |
| Compressor, air | Westinghouse, No. 15 | |
| Compressor packing | U. S. King | |
| Coupler, engine | McConway & Torley | |
| Flexible joints, brake and steam heat | McLaughlin | |
| Flexible joints, aux-loco | Barco | |
| Gages, air, feedwater heater, steam, steam heat, stoker | Ashcroft | |
| Headlight | Electric Service Supply (Keystone) | |

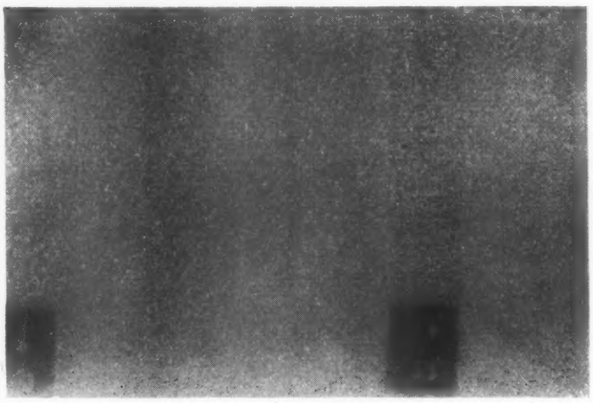
| | AMERICAN | BALDWIN |
|---|---|---|
| Headlight generator | Keystone | |
| Lamp, gage board | Pyle-National, LCP-60 | |
| Lamp, back-up | Crouse-Hinds, LD-23 | |
| Paint | Dupont | Mountain Varnish & Color Works |
| Piping | Reading, w.i., extra heavy | |
| Pipe unions | Corley | |
| Run boards | A. W. Diamondette, No. 12 gage | |
| Safety bar | Franklin Unit (Ewald iron) | |
| Sanders | U. S. Metallic | |
| Steam heat regulator | Leslie, 1½ in. by 2 in. | |
| Train control | General Railway Signal | |
| Universal joints, cab turret valves | Hancock | |
| Washer, rail | Hancock | |
| Wiring, condulet and cab lamps | Crouse-Hinds | |
| Tender: | | |
| Brake shoes | Diamond S | |
| Radial buffer | Franklin | |
| Sprinkler, coal | Hancock, cold water | |
| Tank hose | Anaconda | |
| Tank hose strainer | Hancock | |
| Tank valves | Everlasting | |
| Tender coupler | McConway & Torley | |
| Tender coupler yoke | Farlow | |
| Tender draft gear | Miner, A-22xB | |
| Tender frame | General Steel Castings | |
| Tender truck journal box | Symington, malleable iron | |
| Tender truck journal box dust guard | American | Baldwin |
| Tender truck brakes | American Steel Foundries, clasp | |
| Tender truck brake regulator | Royal | |
| Tender truck side bearings | Stucki | |
| Tender hand brake | Miner D-2928, Ideal Safety Staff | |

of front wheels of the rear truck. The tenders have a capacity for 18,000 gal. of water and 28 tons of coal. The coal bunkers are constructed with concave sides, causing coal to flow freely into the stoker trough.

BRITAIN'S FASTEST ENGINE RETIRED.—Great Britain's fastest and most famous engine, the Great Western locomotive, "City of Truro," has been retired from active service. It has not been scrapped, but has been preserved and sent to the York Railway Museum. The "City of Truro" made British and World railway history in 1904 by achieving the highest authenticated speed ever recorded—102.3 m.p.h.—on the run up from Plymouth when competing for the American mail. The engine was, therefore, the first form of locomotion to pass the 100-m. p.h. mark, and even today still holds the official speed record for a railway locomotive. During its 27 years of service, the City of Truro has run 1,000,438 miles and has lately been employed on the Chester to Oxford, Oxford to London, Shrewsbury to Bristol services. The record was the culmination of the great fight between three railway companies for the American mail traffic via Holyhead and Liverpool on the one hand, and Plymouth on the other. The effect of the run and the securing of the ocean mail traffic by the Great Western virtually placed Plymouth on the direct London-New York route, and established it once and for all as the nearest and quickest port of call between the two cities. The "City" class of engines are of the 4-4-0 type. They were constructed in 1903 and 1904 and at that time were the principal passenger engines on the Great Western system, being used on all the main express services, on the special trains run to Plymouth on July 14, 1903, for His Majesty the King and on the first Cornish Riveria Express on July 1, 1904, which resulted from this Royal special.

# Radiography of Railway Materials—A Correction

IT has been called to our attention that several points in the article by Herbert R. Isenburger on "Radiography Applied to Railway Materials" which was published in the April, 1931, issue of the *Railway Mechanical Engineer,* were not clear. Special reference was



**Radiograph of a sound weld in 2-in. plate stock**

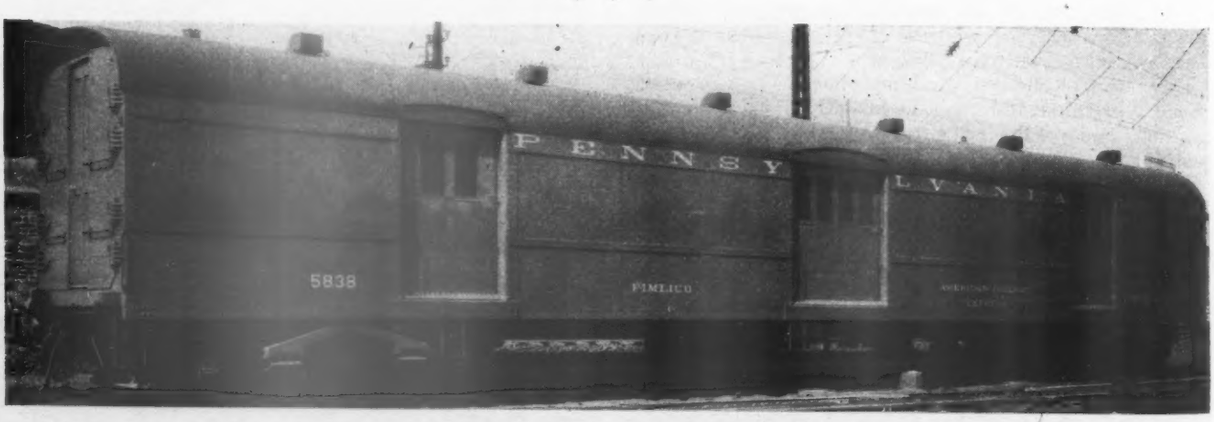
made to the caption under the illustration in the first column on page 175. Although this casting had been passed by the customer's inspector as being particularly good, the radiograph, as stated in the article, revealed a sharply defined crack starting from a small cavity.

Two radiographs referred to in Figs. 1 and 4 of the

**Radiograph depicting an acetylene weld which is rather good**

sketch shown in the second column of page 176, and in the first paragraph on page 177 were inadvertently omitted. The radiographs are shown herewith.

* * *




**One of a number of horse-express cars used by the Pennsylvania for the transportation of polo ponies and race horses**

# South African Refrigerator Cars

By W. B. Dawson*

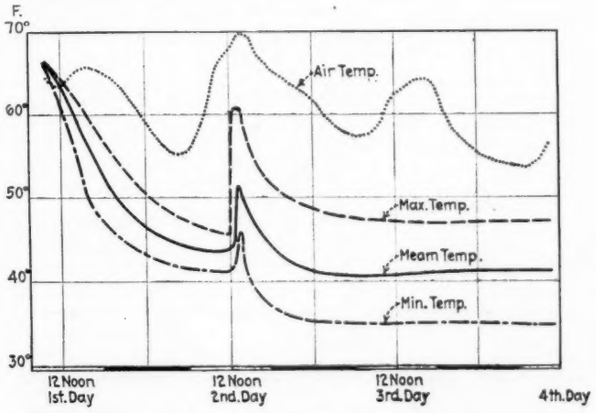
THE South African Railways have developed a refrigerator car with eight ice bunkers built in the roof for the transportation of perishables to Cape Town from points within a 1,000-mile radius. Much of South Africa's export deciduous fruit is grown within easy reach of Cape Town and can be transported safely by rail from the farms to Cape Town in ventilated cars. The necessity for refrigerator cars became apparent when increasing quantities of delicate fruit such as plums, peaches, and pears were cultivated in the vicinity of Johannesburg and Pretoria, necessitating rail transport of approximately one thousand miles from the Transvaal high veld to Table Bay, Cape Town. Unlike America, South Africa does not possess a chain of icing stations along the railway from which refrigerator cars can have their bunkers replenished enroute, nor does the present volume of business justify their erection.

The design of refrigerator cars for the conveyance of perishable traffic over the South African Railways until a few years ago had been based on the American type of car with the ice bunkers at each end. Departure from the conventional design was made when two refrigerator cars with ice bunkers in the roof were built for testing purposes. One of the cars was built with a single roof and the other with a double roof.

### Test Results

Tests with the cars demonstrated the superiority of overhead bunkers which, in addition to insuring a lower inside temperature, had the effect of spreading and maintaining the low temperature more evenly throughout the load. This latter factor is important because fruit stacked in the center of the cars with end ice bunkers ripens more rapidly than that more favorably situated with consequent loss due to over-ripeness and wastage. Moreover, the American type of car showed a relatively bad tare-load ratio, local expert opinion being that it could not be loaded safely to more than half capacity with export deciduous fruit because of the liability of the upper layers becoming unduly hot. Another advantage possessed by the overhead-bunker type of car is an increase of about 10 per cent in loading space created by the absence of the end ice bulkheads.

The figures in the table are the temperatures of test loads of perishables conveyed by the end-bunker iced cars and the new refrigerator cars with single or double roofs.



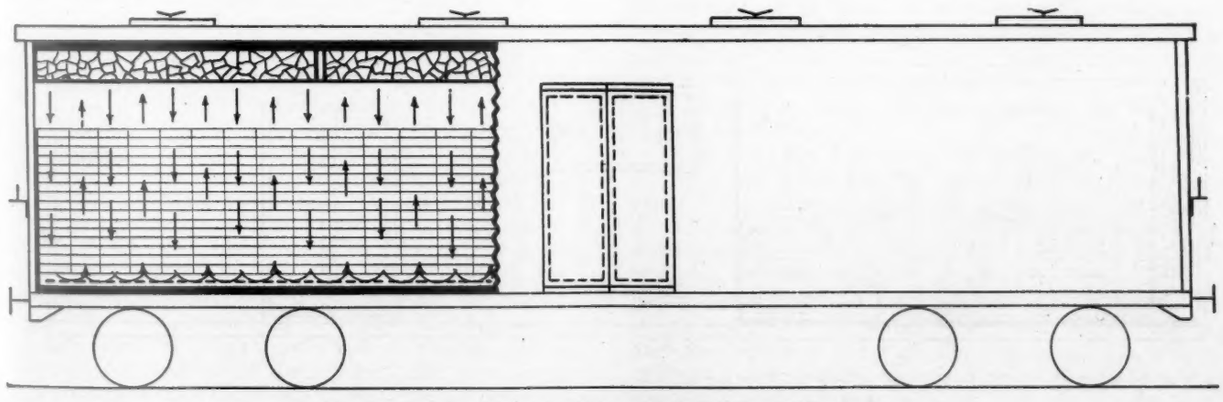

**Temperatures recorded in the end-bunker refrigerator car**

The figures under (b) and (c) are based on averages recorded during several trips made by the roof-bunker cars, while the figures under (a) are averages obtained from records taken in 13 end-bunker cars. These temperatures were recorded just inside the doors, which is perhaps the least favorable position in the car.

**Temperatures at Various Points in the Test Loads**

| | Top | Center | Bottom |
|---|---|---|---|
| (a) End bunker type | 51.5 deg. F. | 49.2 deg. F. | 46.0 deg. F. |
| (b) Overhead bunker type, single roof | 43.3 deg F. | 49.2 deg. F. | 47.3 deg. F. |
| (c) Overhead bunker type, double roof | 40.3 deg. F. | 44.6 deg. F. | 42.0 deg. F. |

The most important deduction from this table, apart from the general decrease throughout in temperatures, is the fact that, with the alteration in position of the



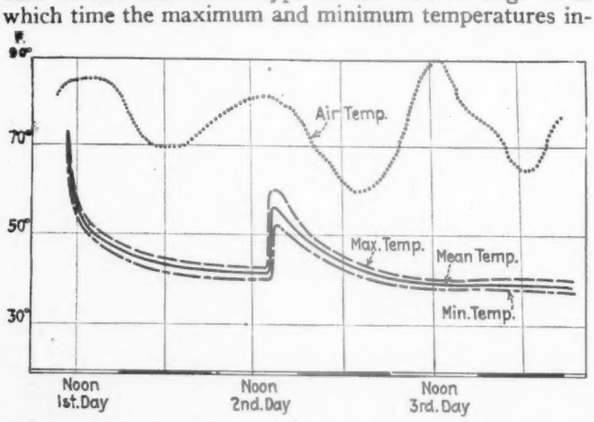
**Air currents in the South African roof-bunker refrigerator car**

* Superintendent of Rolling Stock, South African Railways.

bunkers, the coldest part of the new car is at the top of the load in direct contrast to former conditions, while the warmest section is now situated in the center of the load. The flow of the air currents in the two types of cars is illustrated in the drawings.

In the new cars the difference between the maximum and the minimum temperatures existing in any part of the load is very materially reduced. A feature which was very marked during the tests was the improved radiation of the cold-air currents which produced greater uniformity and stability of temperatures throughout the car.

The highest outside air temperature recorded in the case of the end-bunker type of car was 75 deg. F. at which time the maximum and minimum temperatures in-




**Temperatures recorded in the roof-bunker refrigerator car**

side the car was 65.5 deg. F. and 50 deg. F. respectively. In the case of the overhead-bunker type, the highest outside temperature was 90 deg. F. when the inside readings were only 35 deg. F. and 34 deg. F. respectively. The tests referred to were conducted with a single-roof refrigerator car. After a double roof had been fitted to a similar car it was found that the outside air temperature had less effect on the readings recorded inside.

### Tests Warrant Additional Cars

In the light of the foregoing, the South African Railways Administration decided to adopt the principle of overhead bunkers for its refrigerator cars, and 38 vehicles of this type, with double roofs, have since been built and are now in service. These new cars were put to a severe test during the latter part of 1928 when they were required to convey large quantities of peaches plums and other soft fruits from Johannesburg to Cape Town docks. The fruit was delivered from the various farms to a Johannesburg central cold-storage station where it was adequately pre-cooled and then loaded, once per week, in lots of about 2,000 trays. In the absence of an air-lock at the cold storage plant the cars were iced 24 hours prior to being loaded. Three and a half tons of ice were supplied to each car, which quantity proved sufficient to safeguard the load without recharging before starting the 1,000-mile run to the coast which was accomplished in about 60 hr., including the precooling period.

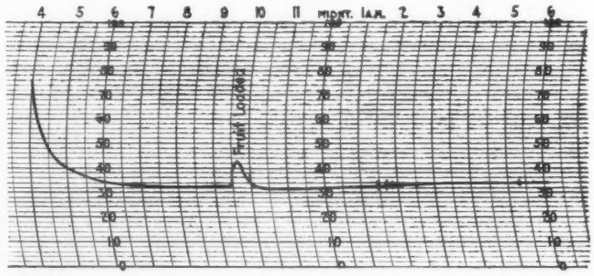
The table shows the temperatures taken at various stages of two consignments, subsequent consignments giving equally good results. All of the fruit was ultimately placed on the London market in excellent condition and brought prices highly satisfactory to the South African farmer.

A Zeals recorder was placed in one of the cars and the record shows the temperature of the fruit at the time of loading, and throughout the journey. The air

**Recorder Car Temperatures**

| Before loading | During loading | 5 hr. after loading | At destination 60 hr. after loading |
|---|---|---|---|
| 36 deg. F. | 50 deg. F. | 35 deg. F. | 36 deg. F. |
| 32 deg. F. | 45 deg. F. | 33 deg. F. | 34 deg. F. |

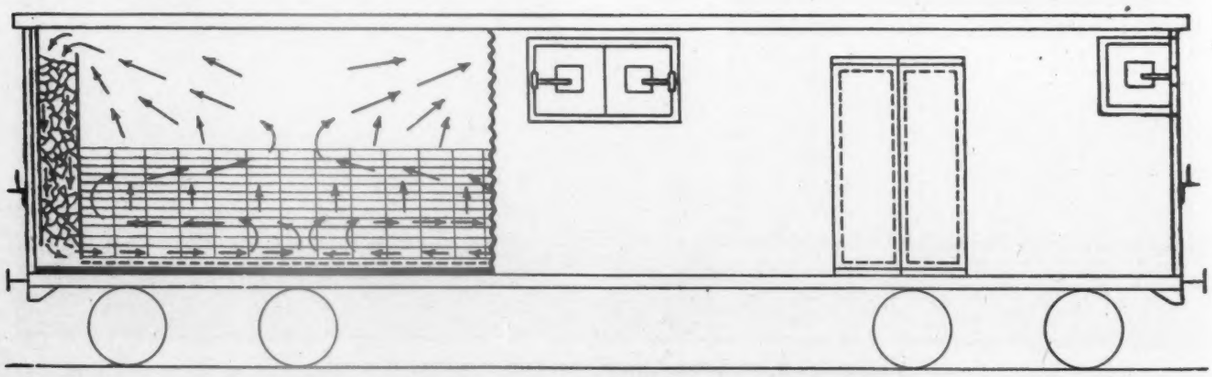
temperature was about 75 deg. F. when the Zeals recorder was placed in the car immediately prior to icing. Although the chart was intended for 24 hr., it was ad-




**One record of the temperature inside the roof-bunker car during a journey from Johannesburg to Cape Town**

justed to disclose the record of the entire journey from Johannesburg to Cape Town.

[Although the cars herein described are apparently solving the problem of transporting perishables on the South African Railways, ones of similar design, used on American Railroads during the advent of refrigerator cars, proved to be unsatisfactory. The chief objections to their use were their high center of gravity, the unusual amount of lading damage resulting from leaking bunkers and the high maintenance cost of the ice bunkers which were being damaged continually by sliding ice—EDITOR.]



**Air currents in the conventional-type American refrigerator car**

# EDITORIALS

## A New Idea In Shop Management

A new idea, or at least one which will be new to most railway shop executives, was advanced by Carl A. Johnson, president of the National Machine Tool Builders' Association, in a recent radio address, when he said that shop supervision, instead of being required to argue for new machinery, should be compelled by the management periodically to justify the continued use of any machinery over a certain number of years old. In this connection, Mr. Johnson quoted the following interesting and suggestive couplet:

"Old machinery in the shop
Shows obsolescence at the top."

It is generally recognized that any machine or piece of shop equipment becomes out of date as soon as another unit is developed which will do more or better work. The question of the continued use, or the replacement, of this obsolete machine then becomes one of relative costs, pure and (not necessarily) simple. The part which modern machinery has played in American industrial progress, as well as the responsibility of management in providing up-to-date equipment, are ably summed up in the following three paragraphs quoted directly from Mr. Johnson's address:

"It has been conclusively shown, many times over, that time-saving machinery raises wages, creates more jobs, and makes available a greater choice of jobs for this and for each succeeding generation of workers. We have, in fact, attained our present standards of living only by the thoroughly American process of constantly improving our machinery, and we can maintain and improve these standards only by rigidly adhering to this policy.

"It has been the practice in most industries for the works manager (shop superintendent, master mechanic, or shop foreman) to ask his management for new machines and be compelled to argue for them. The roles should be reversed. Pressure for the replacement of out-of-date machinery should come from the management down and not from the works up.

"At least once a year, management should procure a list of machines in use, classified by age. Then the works manager should be compelled to prove that any machine over 10 years old can still be profitably used. The simple procedure would disclose some startling leakages of money in almost every plant."

The railroads, as well as other industries, are using a large amount of machine equipment which it would be hard to justify in any complete analysis of operating costs as compared with production secured. In general, with the reduced demand for motive power, the roads are now operating only the newest and most efficient locomotives, and the results are clearly reflected in operating economies. A dollar saved in this way, however, is no more valuable than one saved by the replacement of obsolete machine equipment in shops and enginehouses, and this is a subject in which higher railway officers may well take a personal interest.

In spite of the fact that most railroad shops are not being pushed for high production at the present time, there is a distinct urge for reduced unit cost, which it is unreasonable to think can be kept at the desired low level with much of the machinery now used in railway shops and engine terminals. The need for improved shop machinery and equipment is great, a fact substantiated by recent studies completed by the *Railway Mechanical Engineer*, which show that the railroads bought 14 per cent fewer machine units in 1930 than in the preceding year. Hardly anyone familiar with conditions would venture to say that the number of machines purchased either in 1930 or in 1929 was sufficient to take care of normal depreciation and obsolescence.

## X-Ray Inspection Of Railway Materials

The penetrating power of the X-ray has only been known to science for a little over thirteen years. But during that time the X-ray has developed from an exceedingly useful instrument in the laboratory and hospital to one that is now being used by a number of industries, especially for inspecting materials which are to be subjected to critical stresses. A large part of the credit for the development of the X-ray for industrial purposes must be given to Dr. Ancel St. John who was one of the pioneers in utilizing the X-ray to improve the quality of forgings and castings.

The Ordnance Department of the United States Army was one of the first to utilize the X-ray to inspect materials. The first X-ray machine it used was of portable construction and had a penetrating capacity of approximately six inches. However, this method of inspection enabled the designer of ordnance equipment to reduce the factor of safety in many cases as low as 1 and 1.5. What has been accomplished since the pioneer efforts of Dr. St. John and the Ordnance Department at Watertown Arsenal, was described in an article "Radiography Applied to Railway Materials," which appeared in the April, 1931, issue of the *Railway Mechanical Engineer*, page 174.

The non-destructive testing of critical structures, such as those used in locomotive construction, is becoming of increasing importance, particularly with respect to certain applications of welding. It has been the general practice to design the various parts of a locomotive with a sufficiently high factor of safety to allow for any probable defects in material or workmanship. This factor varies anywhere from three to five according to the nature of the load. Naturally, a high factor of safety means increased weight. There is also to be considered the fact that parts having a larger cross-sectional area occupy space that is gradually becoming more valuable as the size of locomotives increases and clearance limits remain stationary.

There has been a marked improvement in the status of the X-ray for industrial uses during the past seven years. It was stated editorially in the April, 1924, issue of the *Railway Mechanical Engineer* that, "the work of development has not yet progressed far enough to bring the cost of radiographic examination within practical limits for general industrial application." Now the larger industries are finding many uses for the process and are installing the necessary apparatus for making their own radiographic examinations. For those whose problems are not extensive or who face temporary difficulties only, some of the pioneers have established

laboratories which are prepared to take care of such cases. It is, therefore, now possible to have evaluated any proposed use of radiography without great expense.

## Boiler Conditions Now—and Then!

The subjects of locomotive boiler inspection and maintenance in its bearing on operating conditions, and particularly smoke elimination, was discussed at the April meeting of the Smoke Abatement Committee (Railroad Section), St. Louis, Mo. One of the speakers, whose experience evidently covers at least two decades of "railroading," commented on the greatly improved conditions as regards locomotive maintenance and boiler conditions, since the inspection of this equipment and the responsibility for its condition have been in the hands of the Bureau of Locomotive Inspection, Interstate Commerce Commission.

Some of the older boiler inspectors and supervisors, enginehouse foremen, master mechanics, etc., will recall numberless expedients, by means of which they were enabled to "get by" and keep locomotives in service in former days. Before the advent of the 16-hour service law, maintenance forces at terminals, as well as locomotives, worked long hours and motive power conditions were far from satisfactory. Part of the equipment carried on a locomotive at that time consisted of a box of tapered flue plugs, together with a rod for their application, and it was not unheard of for 50 per cent of the boiler tubes to be filled with these plugs in an effort to stop leaks. Bran or sawdust was also carried to stop leaks, railroad companies sometimes paying bills monthly to mills along the road for bran and similar "leak stopping" material. Before the advent of welding firebox cracks were "sewed" with a chain of plugs, which was the only means of repairing cracks.

Bulges in firebox sheets caused by mud burn, bran, sawdust, etc., were cut out and patches applied with patch bolts, excessively caulked. Patches were inset in the back tube sheet to remove the bulged area and cracked bridges, caused by scale and overworking of the tubes. Soft patches were applied at mud-ring corners with the use of bolts and rubber gaskets. Leaky crown bolts and crown stays were caulked until their holding power was reduced to an unsafe degree. A broom or a sheet of tin often served as a convenient shield, deflecting steam and water from the mechanic making repairs to the firebox. Many times, locomotives were operated with an excessive number of broken staybolts and in some instances this condition was permitted to exist for months. Crown-sheet bolts leaked and were cut off, backed up into the water space, the holes tapped out and plugs applied. Excessive numbers of these plugs unquestionably contributed to an unsafe condition of the boiler.

As a result of these and many other similar conditions, the speaker at the St. Louis Smoke Abatement Committee meeting pointed out that accidents and failures were numerous which caused injuries to employees and resulted in the Interstate Commerce Commission's formulating rules and instructions governing the construction, repair and maintenance of locomotive boilers and their appurtenances, approved February, 1911, and put into effect July, 1911, with amendments to cover the entire locomotive tender and appurtenances in March, 1915.

The organized and systematic inspection methods, instituted as a result of the passage of the locomotive boiler-inspection law, were responsible for a notable improvement in boiler conditions. In 1912, 65 per cent of the locomotives inspected were found defective, this figure being reduced to 16 per cent in 1930. The number of accidents per annum decreased in the same period from 856 to 295. As pointed out in the 1930 annual report of Chief Inspector A. G. Pack, there was a decrease of 17.1 per cent in the number of accidents in the past year alone; a decrease of 31.6 per cent in the number of persons killed; and a decrease of 17.9 per cent in the number of persons injured. While the number of accidents still occurring renders it inexcusable for railway men to "rest on their laurels," the results already accomplished reflect substantially improved and, hence, highly commendable, standards of construction and maintenance. If boiler maintenance and operating conditions, common in former years, were permitted today, it is easy to predict what would happen to the present relatively huge boilers carrying previously undreamed-of pressures!

## Grinding Locomotive Journal Bearings

At various times during past years it has been suggested that railroads could add considerably to the life of journal bearings by grinding them instead of finishing them by burnishing. These suggestions have been made in the belief that the savings which could be effected would, within a short time, pay for the cost of installing the necessary grinding equipment. When an axle is turned it is necessary, in order to get the best results, to have the cutting tool pass beneath the low spot on the journal. In finishing by grinding it would only be necessary to remove sufficient material to eliminate the low spot, thus not only saving material and increasing the life of the axle, but also producing a finish which is generally conceded to be superior to that produced by burnishing.

Whenever the question of grinding journals has been brought up objections to it have been raised based on the grounds that fine particles from the grinding wheel might become imbedded in the surface of the journal and cause the bearings to run hot. The extent to which grinding has been employed in railway shops has largely removed any objection of this nature. Locomotive builders have been grinding driving-wheel journal bearings for a number of years with satisfactory results. This, however, is done before the wheels are pressed on the axle, which in itself is not exactly comparable to the problem encountered in the repair shop.

Recently tests were conducted on the Norfolk & Western to determine the practicability and advisability of grinding locomotive driving-wheel journal bearings. The results of these tests and microphotographs of bearings produced by various means of burnishing and grinding appear in an article elsewhere in this issue. It is interesting to note that the microphotograph of the surface of the bearing produced by grinding closely resembles the microphotograph of the surface of a bearing which has run 50,000 miles. This indicates that the quality of the bearing produced by grinding is far superior than that produced by burnishing. These tests also included the running of a ground journal bearing in a bronze bearing for 12 hours at a speed equivalent to 40 miles an hour in the locomotive. The bearings showed no tendency of heating which would seem to refute any statement that fine particles from the grinding wheel will clog the bearing, causing it to run hot.

The Canadian National also ran tests recently to determine the floor to floor time for re-conditioning locomotive driving-wheel journal bearings by grinding. These tests revealed the fact that 9-in. by 15-in. bearings could be re-conditioned in an average time of approximately 35 min. The tests were conducted without any preparation on the part of the railroad and the operator handling the machine was not fully experienced with handling the equipment. The out-of-roundness of the journals ground could, it has been admitted, have been worse, yet, had this been the case it probably would not have entered into the cutting time as a heavier cut could have been taken.

Such time for re-conditioning journal bearings would undoubtedly result in considerable savings in this work. If the mechanic operating the machine earned an hourly rate of 81c, he would have received slightly more than 47c per pair of wheels. This compares with piece work prices of approximately $1.60 paid operators of journal turning lathes on some roads for turning and rolling the same size journals.

Perhaps the cost for re-conditioning journals do not run as high on all roads as the figure quoted above. However, if a reduction in the cost of finishing journals by grinding can be made, even though it might not be to the extent indicated by the difference of the figures quoted above, it certainly is an item worthy of investigation, especially since the superior quality of the work would tend to increase the service life of the axle and journal.

## Piston-Rod And Cylinder Packing

Efficient lubrication plus thorough inspection and maintenance is the price that must be paid to secure good cylinder performance. One road reports that the amount of money saved on piston-rod packing during March, 1931, as compared with the same month of last year more than offset the total cost of all lubricants used on its locomotives during that month. Tests on six locomotives, on which four-months' service from a set of piston-rod packing was considered good performance, showed that seven-months' service could be secured by proper lubrication, and there was no reason why eight-months' life could not be obtained. By making a concentrated drive all over the system, the road has secured a reduction of 389 per cent in the number of piston-rod packing sets used since January, 1930.

With the object of increasing the mileage received from cylinder packing, special attention was paid to the condition of lubricators, choke plugs, drifting valves, and the elimination of oil-pipe leaks. Special efforts were also made to see that the rings were properly fitted and applied. The inspectors kept a close check on piston rods and valve stems, and the enginehouse records were examined and checked for reliability and accuracy.

In a number of instances when cylinder heads had been removed for monthly inspection, the packing was discovered not to be in proper contact with the walls of the cylinder. It was evident that the cylinders had not been calipered before the packing had been applied. No report has been received, in the majority of these cases, of the cylinders blowing. In many instances the bull rings had been allowed to wear down to such an extent as to cause increased wear on the cylinder packing.

The points affecting the services of piston-rod and cylinder packing discussed in the preceeding paragraphs are well-known to all those who are concerned with the maintenance of locomotives. But the very fact that the importance of such detail items in locomotive maintenance are so obvious, is one reason why they suffer neglect while other less obvious matters are receiving close attention. After all, constant application to the fundamentals of good enginehouse practice is what achieves the desired results and leads to progress in the development of methods and materials.

## NEW BOOKS

VIEWS AND REVIEWS OF THE HOT BOX SITUATION—*A correction.*

In a review of this book on page 193 of the April, 1931, issue of the *Railway Mechanical Engineer,* it was noted that the book was published by the Educational Bureau of the Brotherhood of Railway Car Men. This, however, is incorrect as the book is published by the author, T. C. Stewart, 123 North Belmont avenue, Indianapolis, Ind.

PROCEEDINGS OF THE TRAVELING ENGINEERS ASSOCIATION. *Edited by W. O. Thompson, secretary, 1177 East Ninety-Eighth street, Cleveland, Ohio. 460 pages, 6 in. by 8½ in.*

The table of contents for the 1930 proceedings of the Traveling Engineers Association is so arranged that a ready reference to the remarks made by an individual after the presentation of a paper is found directly under the page reference to the subject discussed. The papers presented were on air brakes, frictional bearings, fuel conservation, locomotive piping, long locomotive runs, and the motive power of tomorrow. Several pages of the proceedings are given to a list of past presidents and the subjects discussed during their administrations.

THE MODERN STEAM TURBINE. *By E. A. Kraft, Dr.-Ing., Dr. techn. h. c. Bound in stiff board covers, 7½ in. by 10½ in., 201 pages, illustrated. Published by VDI-Verlag G.M.B.H., Berlin N.W. Price 20 Reichmarks.*

This book which is translated into English has been written, according to the author, with the object of guiding the reader who is interested in steam-turbine design and to give him reliable advice so that he may distinguish the useful from the worthless. The book does not deal with either theory or the general design of the steam turbine, but the author has confined himself to the latest tendencies in turbine construction. In this, he has included a complete description of the Ljungstrom turbine which has been applied to a number of locomotives in Sweden and South America.

The following subjects are covered in the book: Methods of Attaining Higher Economy, which subject is grouped under two heads; namely, Preparation of Steam-Turbine Schemes, and Design. The second general subject, Technical Factors Limiting the Design, is discussed under three subjects; namely, Properties of the Materials, Testing of the Materials, and Stresses. The third part of the book is a discussion of the Principle of Design and the fourth part, the Practical Applications of the Principles of Design. The latter subject is divided into three heads; namely, Turbines for Direct Drive, Turbines for Indirect Drive and Turbines for Very High Pressures. The fifth and last portion of the book covers the general subject of Condensers and Their Auxiliaries.

# THE READER'S PAGE

## Does This Comply With Owner's Standards?

To the Editor:

I have a car on the repair track with coupler head broken. The coupler has 9¼-in. head, a 5-in. by 7-in. shank, an 8½-in. butt and a 1¼-in. by 5-in. wrought-iron yoke, which is in good condition. The car is stencilled '5-in. by 7-in. shank, 8½-in. butt.'

Does paragraph (a), Rule 17, permit me to apply an A.R.A. type D coupler with a 5-in. by 7-in. shank, and a 9⅛-in. butt and to stencil the car, 'A.R.A. Type D coupler' and bill owner? Is it also permissible to apply a 1¼-in. by 5-in. by 9⅛-in. wrought iron yoke and scrap the owner's 8½-in. yoke, or must I maintain owner's 8½-in. standard?

Rule 17 is not clear to me on this question.

E. E. Hosea.

## Master Mechanic Is Wrong About Foremen's Organizations

To the Editor:

On page 85 of the February issue you publish a reply signed "Master Mechanic," in answer to the query "Which Man Would You Hire?"

It would certainly be interesting to the foremen on our railroad to meet the type of man who wrote this. It must be that he fully intends to live up to his title "Master Mechanic," or should he have signed himself "Master Mind," for it is hardly to be expected that any gray matter is left to distribute to the foremen.

The *Railway Mechanical Engineer* has for years been a strong advocate of co-operation between management and foreman, also between foremen and men. Now it is quite evident that Master Mechanic does not want this. His men must be mere automatons; no suggestions wanted. I should like to know, when he invests some of his wealth, whether he invests it in some unorganized industry that is one-man controlled or in some well organized company with a board of directors who hold the "once a month meeting" to exchange ideas and discuss future policies. It is possible that these directors might discuss ways and means of more production or better prices, for their own benefit, which might damage the president's or master mechanic's prestige.

It is doubtful if any business of note is conducted without organization in this day and age. In fact, organization is the key to the success of American industry.

The foremen on our road have an organization sponsored by the officers and, of course, the objectionable feature of personal gain has a place in their meetings. But, in addition, the following subjects are featured: Safety first, fire prevention, distribution of raw and finished material, distribution of men, department delays, department problems, mechanical problems, mechanical failures, shop unit production, etc. Welfare work is at present a feature of the organization.

Supply men have realized the importance of the foremen in the success or failure of their products and are frequently seen at these meetings explaining the operation of their various devices.

Again referring to the subject "Which Man Would You Hire?", give me the organized man who not only has the benefit of personal experience, but also the benefit of the other fellows' experience. The old adage "Two heads are better than one" still stands, even if they are only the heads of foremen.

Foreman.

## Old-Time Air Jammer Replies to His Critics

To the Editor:

I see where some of my fellow workers and brothers in crime have taken exceptions to my article "Dirty and Inoperative, Why?" which was published in the March issue of the *Railway Mechanical Engineer*.

Well, I expected that some one would criticize me and I note that my old friend "Car Foreman" was the first to do so. Let's walk over to the rip track and see him.

"Hello, Car Foreman, how are you? What do you say now? Haven't heard from you in a long while. The last time I heard from you, you had one of our cars on your rip track that, just fifteen days before, had come out of our shops.

"This car had a new cylinder and reservoir, also a new K-2 triple. For some reason or other you condemned—not only called it inoperative but also showed it as dirty. Just what was really wrong with the brake? It was inoperative, yes, but what caused it to become inoperative? you say, referring me to case No. 1666, inoperative is sufficient. All right.

"When a car comes on your rip track for a pair of wheels what do you show on your original record? 'Worn out'? You bet your sweet life you don't. You show 'worn through chill,' 'tread worn hollow,' 'vertical flange' or what have you. Just send that bill into the accounting department with 'worn out' on it and see how quick you will get it back, and the notation from the chief won't only be 'Why?'

"The air brake game is on the rise and the old days when 'That's good enough' are a thing of the past. Remember when some of us used to put a stencil on both sides of the car so we wouldn't have to run around it to find out what date the brake was cleaned last? Remember how we used to miss one of those stencils once in a while? About two months later you got your bill back from the car owner, and you found where someone else had again cleaned that brake and shown the same stencil you had shown?

"Remember how you used to cuss that your men had cleaned that brake and put your stencil on it, but nevertheless there was that old stencil and in the 'Why made' column was 'dirty and inoperative'? Well, that's all done away with now. The note in Rule 60 fixed that up. Well, so much for that.

"You will note in your A.R.A. Manual of Maintenance of Air Brakes on Locomotives and Cars, Rule 102, that it says, 'a triple valve must be tested with a specified testing device to determine whether it would apply or release properly in both service and emergency application, and if the triple valve fails to pass these tests or brake-cylinder leakage exceeds 12 lb. per minute, the entire equipment must be given the attention specified

for cars requiring annual repairs when stencil is out of date.' You will notice that since the single-car testing device has been put into general use and since the issuance of the A.R.A. Manual our air brakes are 100 per cent better than ever before and our men know that they must educate themselves to these conditions, and the results have certainly been gratifying.

"Well, it's nearly time to go home and I am glad I met you and I hope to see you again some time. In the meanwhile, talk this over with your air brake supervisor and see what he thinks about it and let us have his opinion."

AN OLD-TIME AIR JAMMER.

## Discuss Rules at Car Foremen's Meetings? Yes!

TO THE EDITOR:

Just see now how other folks behold us,
Judging from what Mr. Rice has told us.
(Not) By Bobby Burns.

In the good old days referred to by Mr. H. R. Rice in his article entitled "Car Inspectors—Who, What and Why?" which appeared on page 90 of the February, 1931, issue of the *Railway Mechanical Engineer*, I was a small boy going to school and it so happened that one day I was in the room where a class of older pupils were reciting a lesson in Latin from Virgil and my reaction to the proceedings was just about the same as Mr. Rice's at the carmen's meeting. I remember that I fervently hoped that I would not have to go to school long enough to get to the point where I should have to make the fool of myself that those older pupils were making of themselves and, sure enough, my schooling did not reach that far. And even now my opinion of Mr. Einstein's theory of relativity is about the same as Mr. Rice's opinion of the carmen's discussions and probably for the same reason.

The mechanical department insists on safety first, so far as equipment failures are concerned. The transportation department and all other agencies concerned with traffic insist on speed at all times. Thus, the car inspector with a hundred rules and the safety appliance laws to work by is the only retarding factor in the whole organization. His work is the point of friction between the two departments. Naturally he comes in for a lot of criticism and the very nature of the work and the conditions surrounding it cause the inspector to feel the necessity of threshing out every question that has a bearing on it, no matter how technical or trivial it may be or how insipid it appears to those who do not realize what it is all about. Discussions of A.R.A. rules objected to by Mr. Rice, serve the purpose of rounding out and maturing the car inspectors knowledge of the rules and his judgment in applying them. Be assured also that in such discussions he will not be able to bring up any "trick" question that is any more tricky than actual cases that he has to handle in his work, often far removed from all sources of information or advice other than his rule book.

The enforcement of the A.R.A. rules necessarily results in delays to traffic. Lack of their enforcement results in greater and much costlier delays, such as transferring the load at the next interchange point or picking up the pieces with the wrecker. Also, in these latter cases, trying to give a satisfactory explanation as to why it was allowed to happen will entirely demolish that "Great I Am" opinion that Mr. Rice's "average inspector" has of himself. Good inspection which, of course, includes application and reasonable enforcement of the A.R.A. rules will never lose traffic; instead, it safeguards traffic on its way and insures, as far as may be, the ability of the carrier to land it at its destination as quickly as is consistent with reasonable safety. This establishes confidence in the carrier's ability to "deliver the goods," and this confidence is the foundation on which all long-haul business success must rest.

Just what would Mr. Rice suggest in the way of facilitating the movement of the car mentioned by him that was to go the short distance from Indianapolis, Ind., to Muncie, Ind., handled by six crews of five men each? Lax inspection or a complete dispensation of the rules of interchange would not cure the trouble. There is nothing new about this kind of movement; no doubt it is the same route that has long been used. It just so happens that the truck and tractor have sprung up to fill a long felt want and the railroads have not had time to make the necessary adjustments that will enable them to supplement their rail hauls with trucks. But this is purely a traffic problem and the railroads may be depended on to solve it in the most practical manner.

It is hard to see how any considerable benefit would be derived from a discussion by carmen of the railroad companies' car-repair programs. They are not consulted concerning such matters and the public expression of their opinions would probably meet with the disapproval of the company.

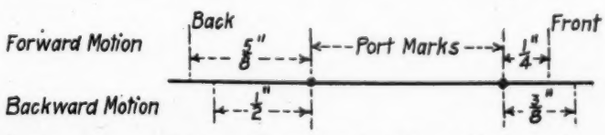
Grant that the rules of interchange are very plainly written and their application seems to be such a simple matter, still the Arbitration Committee has many cases to decide, on which the highest officers of the car departments are unable to agree.

T. J. LEWIS.

## Setting Southern Valve Gear—Information Wanted

TO THE EDITOR:

I have been a subscriber of your valuable publication for quite a few years and look forward to receiving it every month. I enjoy reading the valuable information it contains very much. I wonder if I could get some information in regard to the Southern valve gear. On some of the heavy power on this road, we have the Southern motion to deal with. What I want is information in regard to setting the valves on these locomotives, in the enginehouse by trailing with another locomotive to quickly figure the various changes or alterations to get the valves square. We understand the Walsehaert and Baker valve gears, but the Southern valve gear is different.




**Port openings when hooked up for short valve travel**

I thought possibly some of your readers may have had some experience with this gear. For example, say the locomotive is moved hooked up for short travel and the marks are something like those shown in the sketch. Where would the proper alteration be made to square the valves? With piston valves, inside admission, this would indicate more than having to change the valve rod. Any information you can give will be appreciated.

THOS. J. MARTIN.

# With the Car Foremen and Inspectors

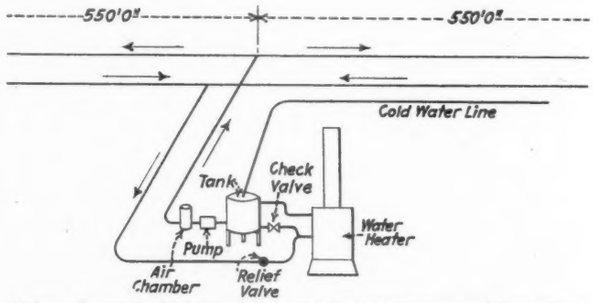
## Grand Trunk Western Car-Washing Facilities

*By R. R. McIntosh**

THE problem of cleaning refrigerator and freight box cars economically, for transporting perishables in the first case and high-class merchandise in the second, has received increased recognition on railroads in the past few years. This has been due of course, to closer competition and the necessity for cleaning refrigerator cars quickly and cutting down overhead on box cars by reducing the number of cars marked for rough freight loading, thus placing them in condition for better revenue service by eliminating spots and odors on the interior surfaces injurious to high-class freight.

The Grand Trunk Western has recently placed in service, at its Chicago car repair shops, a new hot-water washing plant which has several new features of design and is a distinct improvement over the method of cleaning formerly used at this point. Experience with the plant bears out previous contentions that hot water, in combination with a cleaning solvent, is one of the best agents available for cutting grease or oil and for deodorizing purposes.

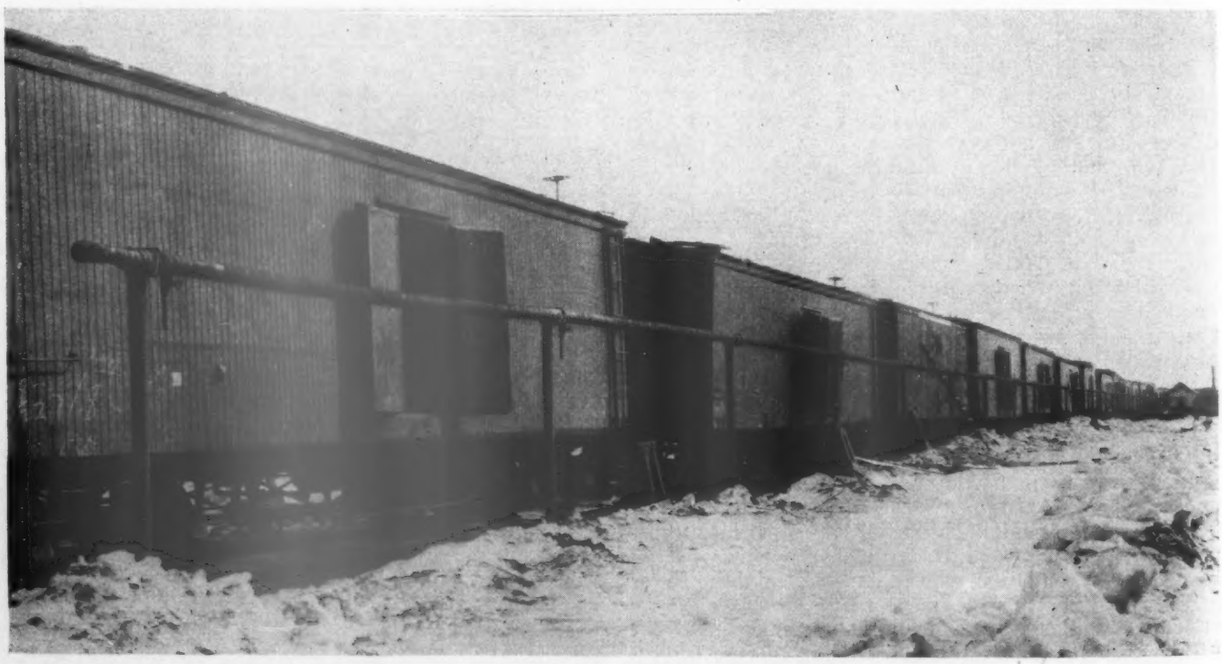
Under the new system, which was designed to cut down the high cost of cleaning cars by eliminating extra car movement and delivering hot water to the cars under pressure, it has been found possible to clean an average of 27 refrigerator cars a day and, in addition, five or six box cars, or a total daily average of 32 to 33 cars, using six car washers, the same as before, with a resultant large saving in cost on the individual cars. This system has been in operation since the middle of December, 1930, and it is worth noting that up to this time a considerable amount of high-class equipment has been placed on a higher-earning basis by transfer from Class C to a higher classification and that none of the




**Diagrammatic layout of the refrigerator-car washing plant**

cars has been turned back on account of wrong classification.

The new plant is simple in design and operation. The first step in its construction was to provide a quick, inexpensive method of heating sufficient water to a suitable temperature to supply the requirements. This was made available by building a hot water boiler from second-hand boiler tubes and plates in such a manner

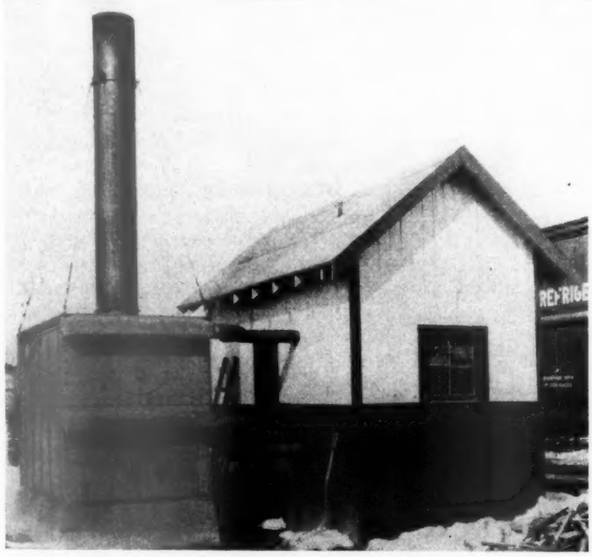


**Hot-water distributing and return lines serving the running repair tracks**

* Mr. McIntosh is assistant mechanical engineer, Grand Trunk Western Battle Creek, Mich.

as to present a large heating surface in a compact space, with the added value of fast circulation. The hot water boiler, illustrated, was constructed on the old ring-type principle of circulation with two-inch tubes welded into four-inch tube headers as the circulating medium, and these were enclosed in a steel casing fabricated from the second-hand plates mentioned above. The interior walls and floor were lined with firebrick salvaged from an old stationary boiler and the baffles were built up of the same material. The four-inch headers were provided with washout plugs at each end. The firebox will accommodate up to 10-ft. lengths of scrap pieces of car timber from car repairs and requires a surprisingly small amount to maintain the water temperature at 170 deg. F. A great deal of refuse is also burned in the firebox.

The second step was to provide ample storage of hot water for all purposes. This problem was solved by utilizing a second-hand heating tank of 600 gal. ca-

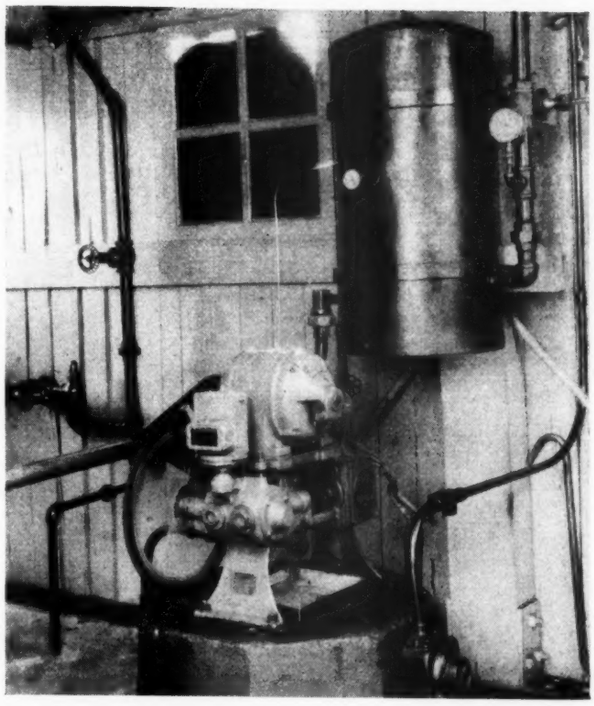


**Hot-water boiler and pump house**

pacity which was on hand at the shops. The coils were removed and an open vent welded on the upper end of the tank. Top and bottom connections were made to the corresponding openings on the headers of the hot water boiler, and the circulating and heating arrangements were complete. To maintain the correct water level in the tank, a cold water supply line with automatic float valve was introduced near the top.

A pump of sufficient capacity and pressure was next installed to furnish hot water to the proposed distributing and return lines economically. After due consideration, a Westinghouse, Type W-800, double-acting, duplex, shallow-well pump, chain driven by a ¾-hp. 110-volt motor, was chosen, and was equipped with hot water valves for the special service required. This is an ordinary house or cottage pump, such as is used for serving two garden hoses with ¼-in. nozzle openings, and, with 60 to 70 lb. pump discharge pressure there is 10 to 15 lb. pressure at the nozzle with a velocity sufficient to throw a stream of water 20 to 30 ft. The pump has a capacity of 800 gal. of water an hour. An air chamber is connected on the discharge side of the pump to eliminate air binding.

Sufficient second-hand pipe with hair felt insulation and canvas covering was reclaimed from the old steam



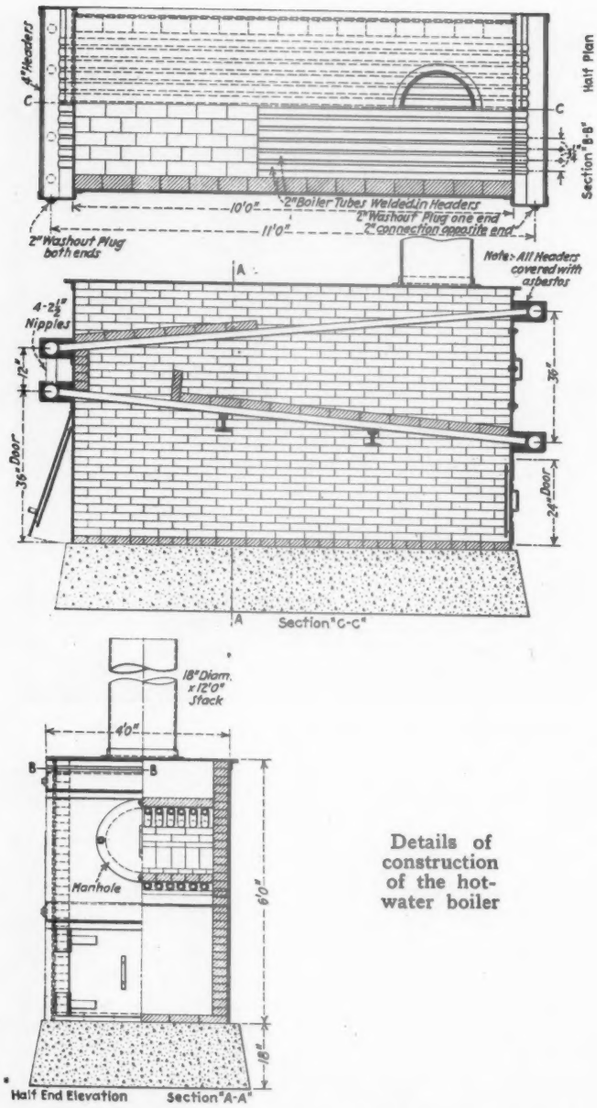
**The pump and air elimination tank in the pumphouse**

piping at the shops to erect an overhead distribution system along the running repair track, extending 550 ft. in each direction from the storage tank and pump, with corresponding return lines to the bottom circulating line connecting tank to boiler. A relief valve was set in the combined returns just ahead of the circulating line to maintain the proper pressure. Between the tank and the junction with the return line a check valve was installed, causing the return water to circulate under overflow pressure through the hot-water boiler and allowing the tank water to flow only when the head of water in the tank is greater than the overflow pressure. This insures a rapid flow of water to aid boiler circulation.

The piping was supported at a height of approximately eight feet from the ground on four-inch boiler tubes, reclaimed from a scrap horizontal return tubular boiler and installed vertically in small concrete foundations at 20-ft. intervals. The entire outside run of piping was installed quickly and cheaply by welding all joints, and expansion and contraction are permitted free movement by the fact that the pipe rests on horizontal rods passing through the top of the uprights. The hose connections are ¾-in. in diameter and are welded into the distributing line at suitable points, furnishing ample facilities not only for the running-repair track but also on three adjacent tracks, if desired by increasing the hose length.

The system has been a success from the start of operation. It has been found that from eighty to eighty-five per cent of the refrigerator cars cleaned need only be washed vigorously with the hot water under pressure. The labor cost of renovating these cars has been reduced greatly, due to the rapidity with which the work can be performed.

The method of procedure with a box car in bad condition, after all refuse has been removed, is to mix 10 lb. of Wyandotte cleaner with 5 gal. of hot water in a sprinkling can. This mixture is stirred until it en-




Details of construction of the hot-water boiler

ters into solution and is then sprinkled over the surface to be cleaned, lightly on spaces comparatively free from spots, and heavily on places where there are spots hard to remove. The mixture is allowed to soak into the wood a sufficient length of time, as determined by experience, to penetrate some distance and loosen up the substance it is desired to remove. The surface is then scrubbed briskly with a stiff brush and the matter in the wood is brought to the surface and washed out with the hot water from the storage tank. Drying is then hastened by wiping off the surface with a squeegee. It has been found possible to clean cars which have been loaded with hides, oils, coal, bone fertilizer, mustard, lime, cement, plaster and creosoted ties and return these cars to service with classification for high-class freight.

Where the cleaner is used in refrigerator cars, the same solution is used. The racks are lifted up in sections and placed in a standing position on the opposite side of the car while the floor and lining on one side is cleaned and washed. The bottoms of the racks are then cleaned and the racks replaced. The same operation is followed on the opposite side. The tops of the racks are scrubbed when they are replaced and the whole car is then flushed out with hot water.

The average cost of cleaning cars, both refrigerator and box cars, has been reduced to a nominal figure, due to the ease with which water is heated to a high temperature and delivered to the car, and to the large increase in the number of cars washed daily with the same labor as was used previously on a smaller number.

All work is done on the running-repair track except in special cases where the car happens to be spotted on one of the three adjacent tracks and it is not desired to make the extra movement.

The system is adaptable to large and small repair tracks by enlarging or reducing the size of boiler, storage tank and pump, and the first cost can be lowered on smaller installations by eliminating the distributing and return lines and using several lengths of hose directly from the pumping station.

Incinerator where refuse from the cars is burned without danger of giving off sparks

## Decisions of Arbitration Cases

*(The Arbitration Committee of the A.R.A. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)*

### Wheels Mounted Improperly

Pennsylvania Tank Line car 5087, in leased service of the Texas Company, was repaired by the Atlantic Coast Line at Charleston, S. C., on September 7, 1928, and November 14, 1928, the repairs included two pairs of new wheels, at R. & L., 3 and R. & L. 4 on the respect dates. The Pennsylvania Tank Line requested a defect card from the A.C.L. on the authority of joint evidence dated January 11, 1929, covering two pairs of wheels improperly bored, causing them to be out of gage. The improper repairs were corrected by the Southern on authority of the joint evidence. A.C.L. refused to give a defect card covering the wheels at R. & L, contending that the car owner was not entitled to protection on the basis of improper repairs prior to August 1, 1929, as set forth by A.R.A. Rule 81. It also refused to grant a defect card covering the wheels at R. & L. 3, contending that the claim should be withdrawn, since the alleged wrong repairs were made on September 7, 1928 (the car returned home three days later) and the joint evidence was not secured until January 11, 1929. The Pennsylvania Tank Line stated that the joint evidence, in the case of the wheels removed at R. & L. 3, was not secured

within 90 days after the car returned home, because the nature of the defect is such that it could not be detected until some evidence of uneven flange wear had manifested itself. When the defect was discovered, the wheels were so badly out of gage that it was necessary to remove them for this reason alone, and the Pennsylvania Tank Line contended that the A.C.L. should be responsible for wrong repairs.

The decision rendered by the Arbitration Committee is as follows: "The Atlantic Coast Line Railroad is responsible for the improperly mounted pair of wheels applied at location R. & L. 4, in accordance with the joint evidence which was obtained within the required time limit and with due regard to the fact that no other defects were involved. Claim of improper repairs on the other pair of wheels is not sustained, in view of failure to obtain joint evidence within the time limit on basis of Rule 81 in effect on date wheels were removed."—*Case No. 1657—Pennsylvania Tank Line vs. Atlantic Coast Line.*

### Car Damaged, Subject to Rule 44

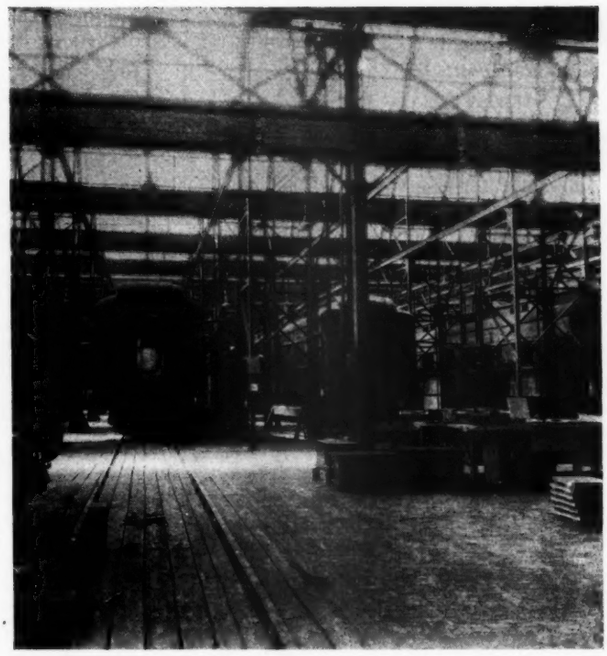
National Tank Car Company car 2308 was repaired January 25, 1929, by the Missouri Pacific at its shops at North Little Rock, Ark. In addition to other repairs there were included two center channels straightened on account of being bent. The Missouri Pacific billed the National Tank Car Company as required by rule 44, contending that the damage was owner's responsibility. It based its contention on the fact that the car was damaged in ordinary train handling and was not subjected to unfair handling covered by Rule 32. It also furnished joint evidence that the condition of the draft sills was the result of progressive deterioration and contended that this was the primary cause of the damage. The National Tank Car Company stated it could not secure from the Missouri Pacific any definite information concerning the circumstances surrounding the cause of the damage as required by Rule 44 and contended that, inasmuch as the provision of Rule 44 had not been complied with, the handling line was responsible.

The following decision was rendered by the Arbitration Committee: "The evidence offered by the repairing line as to the circumstances under which the damage occurred is not sufficient to establish responsibility of the car owner on the basis of Rule 44 in effect at date of the damage."—*Case 1658, Missouri Pacific vs. National Tank Car Company.*

## Scaffolding in Coach Shops of the F.E.C.

THE Florida East Coast has scaffolding of light steel construction installed in its Miller coach shops, St. Augustine, Fla., in which have been incorporated conveniently spaced permanent ladders and the platforms of which are easy to manipulate. The scaffolding was installed at the time the buildings were constructed in 1926. It will be noted from the illustration showing the interior of the Miller coach shops, that the scaffold structure is built in units consisting of four structural-steel columns, suitably braced, and spaced at regular intervals between the repair tracks.

Each unit is spaced about 9 ft. apart along the repair tracks. The four vertical members of each unit are 4-in. by 4-in. by $\frac{5}{16}$-in. angles, spaced 6 ft. 6 in.



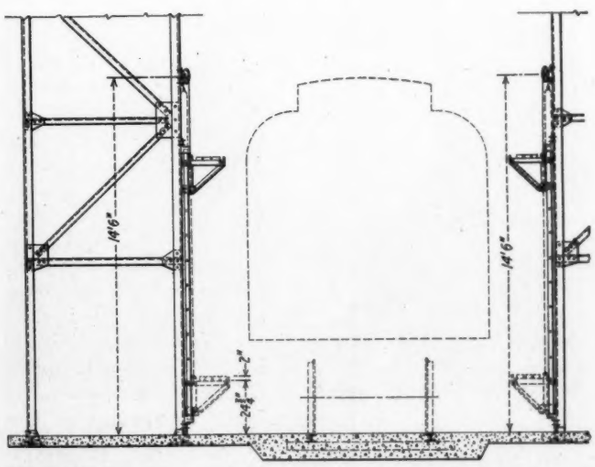
**Interior of Miller coach shops of the Florida East Coast at St. Augustine**

along the track and 6 ft. 3 in. between tracks. The repair tracks are spaced 22 ft., center to center.

The four vertical members of each unit are braced as shown with 3½-in. by 3½-in. by ⅜-in. angles. The columns to which the platform brackets are secured, are of 2-in. standard full-weight steel pipe. They are secured to the units as shown, the top and bottom connections being made of cast iron. The bracket pin holes in the pipe columns are spaced one foot apart. With this arrangement, the scaffold bracket has an adjusting range, from top to bottom, of 9 ft.

Details of the scaffold bracket and pin hinge are shown in one of the drawings. The bracket is easy to adjust because there are no corners or flat surfaces on which to bind. The pin is secured to the bracket by means of a No. 4 coil chain, 12 in. long.

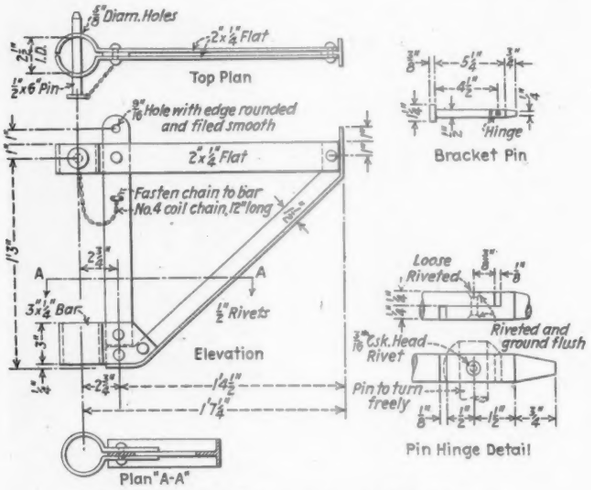
The scaffold platform is made in various lengths to suit, ranging from 16 ft. 11 in. to 19 ft. 9 in. It is braced on both sides by 2-in. by 4-in. wood members,




**Scaffold arrangement as installed in the Miller coach shops of the Florida East Coast**

fastened together with ½-in. by 12-in. through bolts.

The track side of each scaffold unit is provided with ladders, which extend from the floor to the maximum

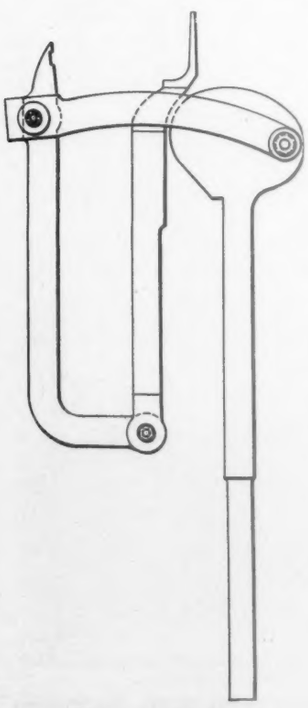



**Details of scaffold bracket and pin hinge**

height of the scaffold platform. These ladders are secured to the outside of one or more of the vertical members of each scaffold unit to suit requirements. They are made of structural steel with round spacers.

## Applying Springs to McCord Journal-Box Lids

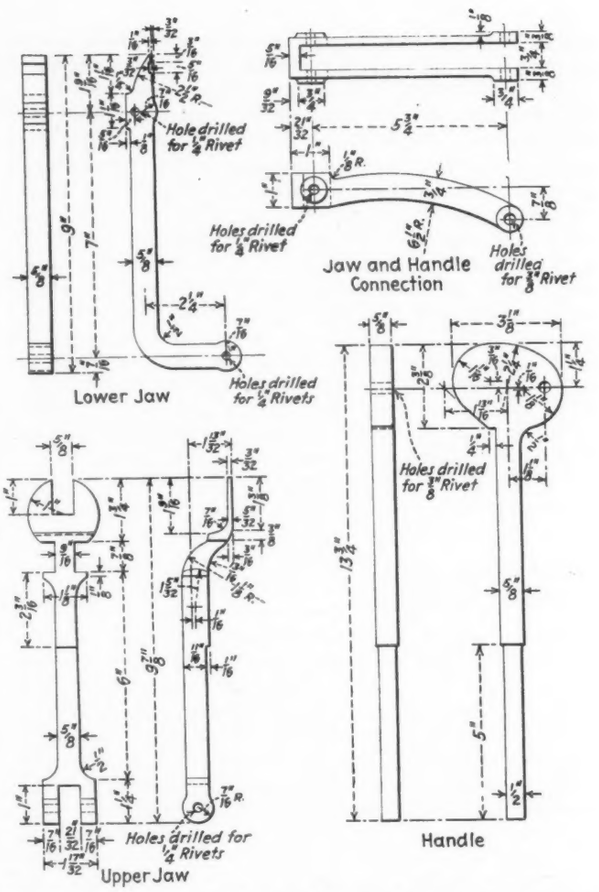
THERE are many cars still in service, the journal boxes of which are equipped with McCord lids having the coil spring and tee pin. The compressing tool shown in the two drawings has been used for a number of years on one railroad for applying the spring and tee pin in car shops and at outlying repair points.



**The assembled tool**

To apply, the tee pin is inserted inside the spring coil and the cross-arm of the tee pin is then placed in position under the top lugs on the box. The lower jaw of the compressing tool (in open position) is then inserted under the edge of the top lug. The 5/16-in. notch prevents the jaw from slipping off the lug. The upper jaw is placed over the opposite end of the spring and the two jaws are brought together by the cammed head as the handle is moved down.

The 1-in. by ⅝-in. notch in the upper jaw permits free movement of the jaw along the tee pin. While the spring is

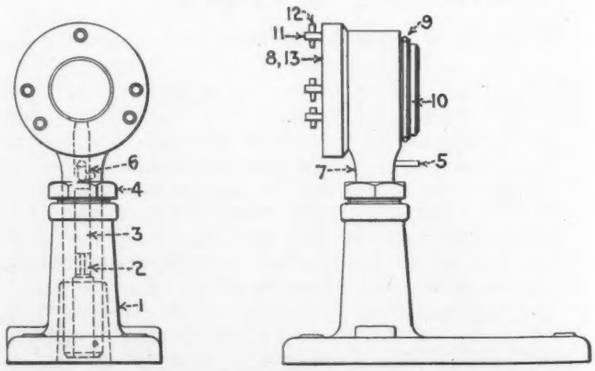



**Details of the compressing tool for applying the spring and tee pin on McCord journal-box lids**

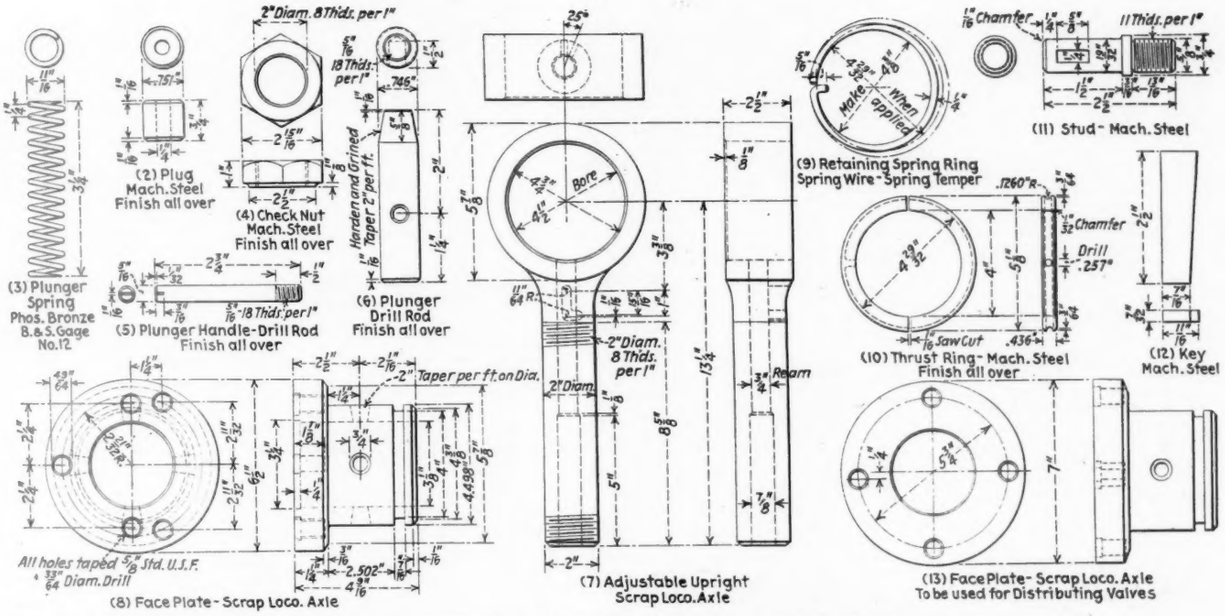
compressed, the lid is lowered to position and secured to the tee pin. The spring is released on completion of this operation. All the parts of this compressing tool are of malleable iron.

## Stand For Repairing Distributing Valves

SHOWN in the three drawings are the assembly and detail parts of a stand for repairing triple and distributing valves in an eastern railroad shop. Referring to the assembly drawing, the valves are secured to

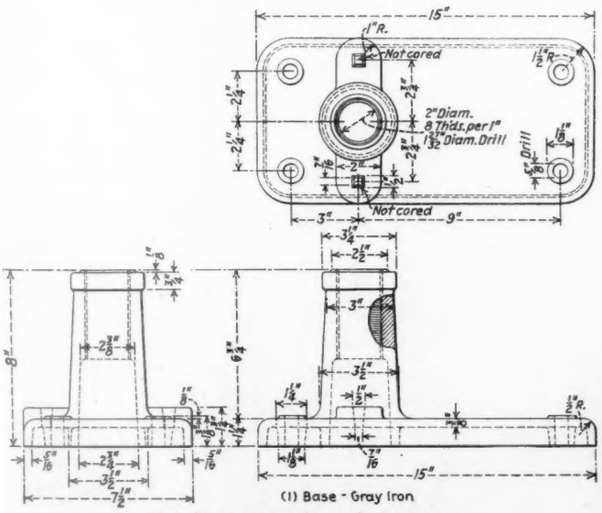



**Assembly drawing of the stand for repairing distributing and triple valves**


(2) Plug Mach. Steel Finish all over
(4) Check Nut Mach. Steel Finish all over
(3) Plunger Spring Phos. Bronze B. & S. Gage No. 12
(5) Plunger Handle-Drill Rod Finish all over
(6) Plunger Drill Rod Finish all over
(7) Adjustable Upright Scrap Loco. Axle
(8) Face Plate - Scrap Loco. Axle
(9) Retaining Spring Ring Spring Wire - Spring Temper
(10) Thrust Ring - Mach. Steel Finish all over
(11) Stud - Mach. Steel
(12) Key Mach. Steel
(13) Face Plate - Scrap Loco. Axle To be used for Distributing Valves

**Details of the stand—The numbers correspond with those shown on the assembly drawing**

the face plate (13) by means of a stud (11) and a key (12). The face plate can be revolved on the base (1) or adjusted with respect to height, as desired. It is made from a scrap locomotive axle. The back of the face plate is grooved as shown for the thrust ring (10). The thrust ring, which is sawed in half, is held in position by a retaining spring (9). A check nut (4) is screwed on the shank of the adjustable upright (7), as shown. The shank is hollow bored for the plunger (6) and the plunger spring (3). These parts are held in position by the plug (2). The plunger (6) is drilled and tapped to take the 5/16-in. plunger handle (5). It is hardened and ground at the top end to reduce wear. To apply a valve to the stand, the plunger handle is pressed down which depresses the plunger against the plunger spring. This holds the valve in position and allows the workman to use both hands to adjust the valve on the stand and secure the clamping keys. The face plate can be easily removed from the adjustable upright by removing the retaining spring ring and thrust ring.

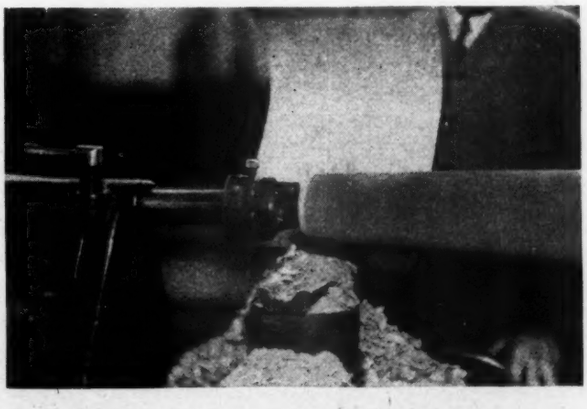



**Detail construction of the base**

## Turning Taper On Push Poles

IN the planing mill of an eastern road the taper on push poles is turned by merely offsetting the center of the tail stock. The carriage with the cutting tool moves parallel to the bed of the wood lathe, the offsetting of the tail-stock center eliminating the necessity of a taper attachment or the manipulation of the crossfeed of the carriage by the operator.

The offsetting of the center is accomplished by clamping a piece of bar steel to the tail-stock spindle. The piece is machined to the shape shown in the illustration and is fitted with a set screw for securing it to the tail stock. The other end of the piece is drilled and bored to a taper finish for the insertion of the regular center, which is transferred from the tail-stock spindle.



**The off-setting of the tail-stock center of this wood lathe eliminates the necessity of a taper attachment or the manipulation of the crossfeed to cut the taper on the ends of push poles**

The distance between the center line of the tail stock and the offset center is dependent upon the standard taper used on push poles. On the road where the center was designed, the center is offset 3 in.

After turning the entire length of the push pole to size from the rough, the small center is removed from the tail stock and inserted in the offset hole. The end of the pole is marked where the taper is to begin and the tool is set at that point. When the lathe is started the carriage moves parallel to the bed, cutting the taper. The pole is reversed in the lathe for cutting the taper on the opposite end.

## Slotting Decking to Clear Rivet Heads

WHEN applying decking on a car it is of course necessary to prepare the boards with slots to clear the rivet heads along the center sill. This is usually done by placing the faces of two boards together

**Preparing car decking for rivet-head clearance by drilling**

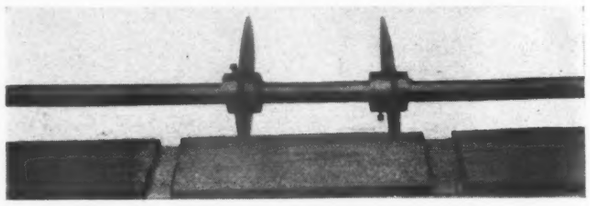
and drilling a hole through the flushed edges, one-half of the hole being in each board. The semi-circular recess thus prepared clears the rivet heads, permitting the decking to be placed evenly along the center sill.

To eliminate the necessity of drilling the decking in this manner, an Eastern railroad shop mounted on the shaft of a circular saw two saw blades set at an oblique angle, the horizontal distance travelled by the periphery of the blade set at this angle being sufficient to cut a slot in the decking of the required width to clear the rivet heads. This saw, because of the peculiar action of the blades while in motion, has been designated as the "wiggle saw." In one of the illustrations is shown

**The wiggle saw used for cutting parallel slots in car decking**

the parallel slots cut by the blades and also the manner in which the blades are mounted on the shaft of the machine. The decking is fed through the machine continuously on a conveyor, the blades cutting the parallel slots as the planks pass beneath them.

The installation of this saw has resulted in a net saving of 88c per 100 planks prepared for car decking in



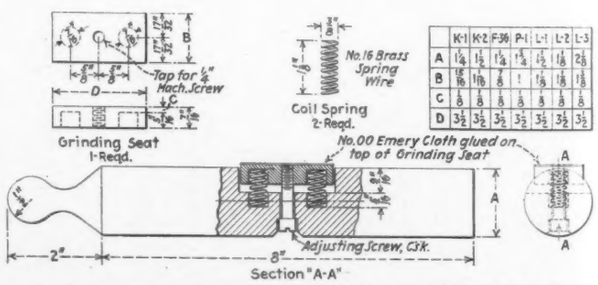
**Slots cut in car decking and, in the background, the saw blades mounted obliquely on the shaft, for cutting them**

this manner. Comparative illustrations are shown of the two methods of preparing the decking with these slots. In the one illustrating the wiggle saw is shown with a single plank on the conveyor belt to avoid confusion and clearly indicate the operation of the saw blades.

## Triple Valve Grinding Tool

IN the drawing is shown a tool for grinding slide-valve seats of triple valves. The tool automatically guides itself from the back of the bushing in the same position that the broach is guided when rebroaching a valve. The tool is fitted with a plate supported on two brass wire springs which forms a grinding seat. No. 00 emery cloth is glued to the surface of this plate. When in use the plate is pressed down to permit the tool to enter the valve bushing.

When the plate is released the face is held against the


Tap for ¼" Mach. Screw
No.16 Brass Spring Wire
Coil Spring 2-Reqd.
Grinding Seat 1-Reqd.
No.00 Emery Cloth glued on top of Grinding Seat
Adjusting Screw, C'sk.
Section "A-A"

| | K-1 | K-2 | F-36 | P-1 | L-1 | L-2 | L-3 |
|---|---|---|---|---|---|---|---|
| A | 1¼ | 1½ | 1¼ | 1⅜ | 1½ | 1⅝ | 2⅛ |
| B | 15/16 | 1⅛ | ⅞ | 1 | 1⅛ | 1⅛ | 1⅛ |
| C | ⅝ | ⅝ | ⅝ | ⅝ | ⅝ | ⅝ | ⅝ |
| D | 3½ | 3½ | 3½ | 3½ | 3½ | 3½ | 3½ |

**A triple valve grinding tool used for spotting slide valve seats in the valve bushing**

slide valve seat in the valve bushing by means of the springs. The tool is then stroked backward and forward until a smooth seat is obtained on the valve bushing. The slide valve is rubbed over a piece of No. 00 emery cloth and worked on a face plate until smooth. The slide valve is then inserted in the bushing and ground into the valve seat from which all high spots have been removed by the use of the tool. The average time consumed in grinding a slide valve which has a cut seat is about ten minutes. The tool can be designed for various sizes of triple valves. The dimensions of the tool for various types of triple valves are given on the drawing.

In the

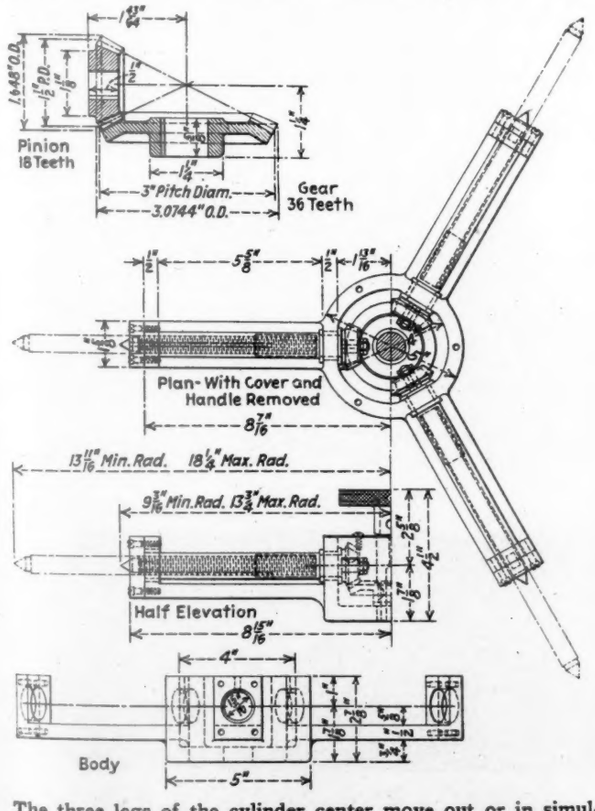
# Back Shop and Enginehouse

## Gear-Operated Cylinder Center

IN the drawing is shown a gear-operated cylinder center, the legs of which all move out or in simultaneously and equally, thus eliminating the necessity of adjusting and re-adjusting each leg separately until the center is squared in the cylinder. A single 36-tooth gear with a pitch diameter of 3 in. meshes with three 18-tooth pinion gears of 1½-in. pitch diameter. The pinion gears actuate the in and out movement of the legs whenever the main gear is turned. A knurled handle is keyed to the shaft of the main gear for this purpose.

Each leg of the center is comprised of a sleeve, each of which is keyed to one of the pinion gears and tapped out for the insertion of a ⅝-in. screw. For small-diameter cylinders a small pointed head 1⅛ in. long is set in the end of the screw. With this small head, the maximum radius to which the legs of the center can be extended is 13¾ in. while the minimum radius is 9-3/16 in. For cylinders of large diameter a rod is used which measures 5⅛ in. from the pointed tip to the shoulder which sets against the screw. The maximum radius of the center, using this rod, is 18¼ in. while the minimum radius is 13$\frac{11}{16}$ in. The gears, sleeves and screws of the center body and legs are fitted with cover plates for the exclusion of dirt.

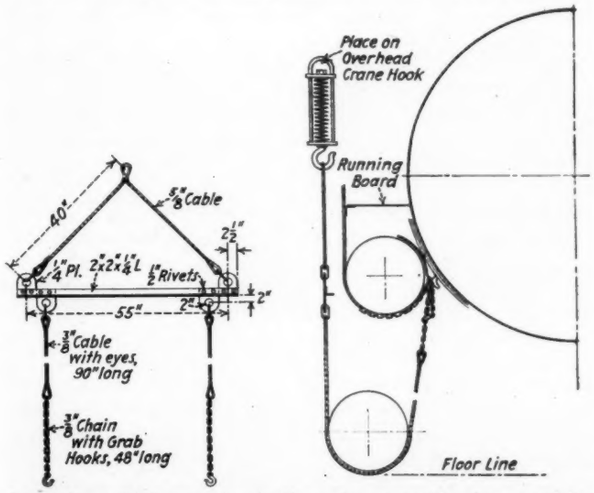
When using the center, the knurled handle is turned to the left to draw the legs in so that the center will enter the cylinder. After it is set in the cylinder the handle is turned to the right, moving the legs outward equally until they come to rest against the cylinder walls. Thus the center is accurately set up in place without necessitating the use of calipers to square it.




**The three legs of the cylinder center move out or in simultaneously, each actuated by a pinion gear which meshes with the main operating gear**

## Device for Lifting Air Reservoirs into Position

AFTER removing air reservoirs in the engine-house it is often difficult to replace them, especially if they are mounted beneath the running board as is most frequently the case. The method usually employed is to roll the reservoir into position on chains or cables, a truck-mounted crane, overhead crane, or a chain block being used to raise the chain or cable. This practice is safe, provided the chain or cable is carefully equalized so that the weight of the reservoir is equally distributed on it. It is not an infrequent occurrence to have the turn of the chain or cable at one end of the reservoir slip, allowing it to fall to the floor.




**A device which permits rolling air reservoirs into position beneath running boards with safety**

To avoid the slipping of the chain or cable, it is good practice to use two chains for this work, one of which is attached to each end of a bar, to which, in turn, is attached a sling for hooking the crane or the chain hoist. Such an arrangement is shown in the drawing. This device for raising air reservoirs is comprised of a ⅝-in. cable sling, a spreader bar made of 2-in. by 2-in. by ¼-in. angle iron and a combined cable and chain, 90 in. and 48 in. long, respectively. A spring shock-absorbing device is used between the ⅝-in. cable sling and hook on the crane to take up any shocks which might be incurred when the reservoir is swung into position in its brackets.

When in use, each cable and chain is hooked to the reservoir bracket and is lowered to the floor, after which the reservoir is set in place. As the crane lifts the spreader bar, the reservoir rolls on the cable-and-chain slings until it comes to rest in the brackets. The cable and chain being separated equally by the spreader bar which is always balanced by virtue of the fact that it is suspended from a single point, eliminates any possibility of the cable and chain getting out of position.

# Investigation of Surfaces of Locomotive Journal Bearings

*By W. E. Wilcox* and J. R. Page†*

IT would be impossible to operate modern locomotives over long distances at sustained high speeds if it were not for the efficiency of the bearings. The driver journal bearings are the most important and, since they are very difficult to machine and fit properly, much care must be exercised in this operation. The surfaces of these bearings should be produced as nearly perfect as possible before being placed in service, as the smoothness of the surfaces will increase the actual bearing area and materially decrease the possibility of the bearing becoming overheated.

If the journal bearing is correctly finished and fitted, it will run properly, unless affected by abnormal conditions, such as, improper lubrication, stuck wedges, improper spacing, eccentric loading, etc. If care is not taken in the machining of these bearings, it is very probable that the bearing surfaces will become overheated when first placed in service, regardless of the method of lubrication. Should this occur, it is unlikely that the bearing will ever run cool, but in all probability will continue to give trouble and finally result in a hot box.

In an effort to determine the best method of machining driving wheel journal bearings, we have produced journal-bearing surfaces by all the practical methods of machining and, in order to make a close study of these surfaces, we have taken photomicrographs at 100 diameters which show the condition of the surfaces very clearly. The purpose of this study was to produce a surface on a driving-wheel journal that would compare with the surface of a journal that had been in service for approximately 50,000 miles on a fast mountain-type locomotive which was considered satisfactory for all practical purposes. In cases where the finished journals were run in a bronze bearing, they were run for 12 hours at a speed equivalent to 40 miles an hour.

* Mr. Wilcox is shop inspector at the Roanoke shops of the Norfolk & Western.

† Mr. Page is material inspector at the Roanoke shops of the Norfolk & Western.

Bearing No. 1 represents a surface with smooth finish, water cut. The surface shows considerable pitting and checking due to breaking up of the embrittled, cold-worked surfaces. Surfaces of this kind make very poor high-pressure bearings, as the ridges and high places pierce the lubricating film and cause metal-to-metal contact, which results in a hot bearing.

Bearing No. 2 represents a smooth-finish, water-cut bearing surface, rolled in the same direction as it was machined. The surface shows some improvement, but it is far from perfect and the checking and pitting still stand out prominently.

Bearing No. 2*a* represents a surface that has been machined in the same manner as bearing No. 1, rolled in the same direction, and run in a bronze bearing in the same direction, the object being to produce the effects of actual service on the bearing. The surface shows considerable improvement because in all operations subsequent to machining the axle was rotated in the same direction as when machined. The pits and cracks have been filled and smoothed over, resulting in what we consider a smooth surface.

Bearing No. 3 represents a surface that has been machined in one direction and rolled in the other. This surface shows considerable pitting and checking, because the rough ends of the metal were not pressed back into their original places.

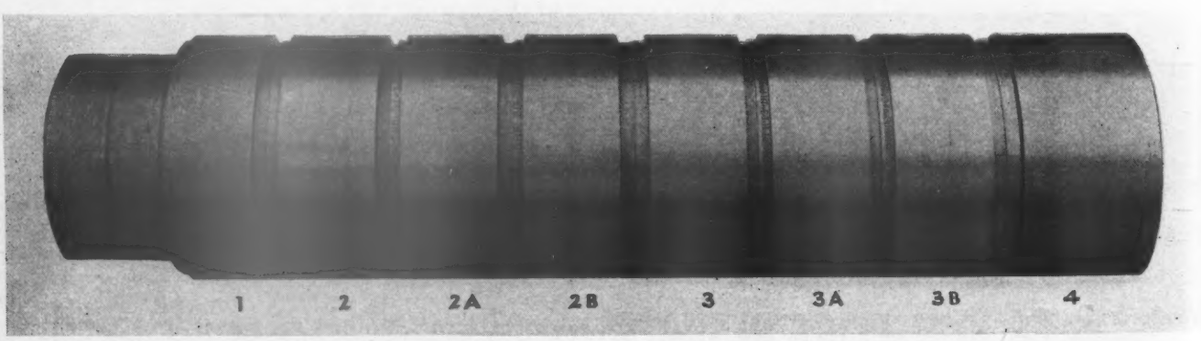
Bearing No. 3*a* represents a surface that has been machined in one direction, rolled in the other and run in a bronze bearing in the same direction as it was machined. This surface shows considerable checking and pitting and represents a surface that could not be considered smooth enough for high-pressure bearing service.

Bearing No. 3*b* represents a surface that has been machined in one direction then rolled and run in a bronze bearing in the opposite direction. This surface is an improvement over bearing No. 3*a*, but shows considerable checking and pitting. This method of finishing does not produce as smooth a surface as when all operations are in the same direction.

Bearing No. 4*b* represents a surface that has been machined as bearing No. 1 and then ground. This surface is free from pitting and checking and is decidedly smoother than any of the other surfaces produced. The grinding has removed all pits and microscopic cracks left from machining and represents a smooth surface.

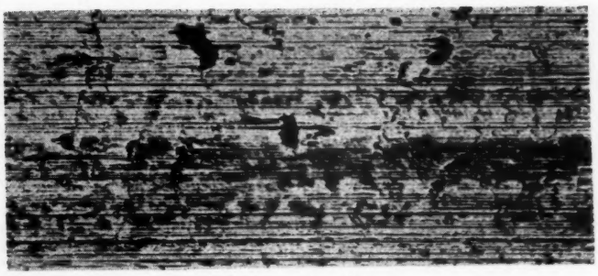
Bearing No. 4*b* represents a surface that has been machined the same as Bearing No. 1, then ground and run in a bronze bearing for 12 hours. This is a very smooth surface, free from microscopic cracks, but has not been run in the bearing long enough to remove all the marks left from grinding.

Bearing No. 5 shows the surface of a journal which

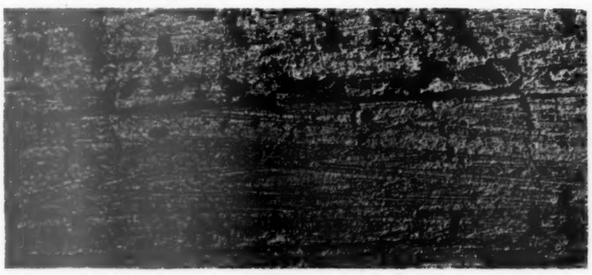



**The microphotographs show all bearings with the exception of 2b and 4b**

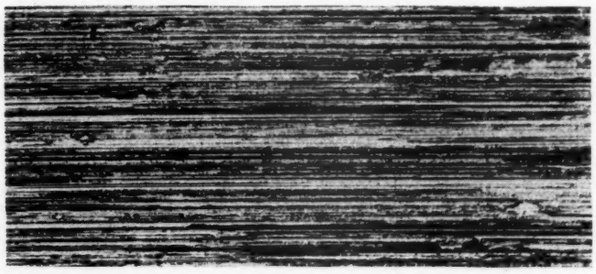
No. 1—Machined←



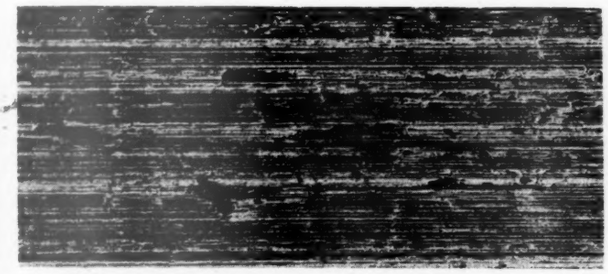
No. 3b—Machined←, Rolled→, Bearing→



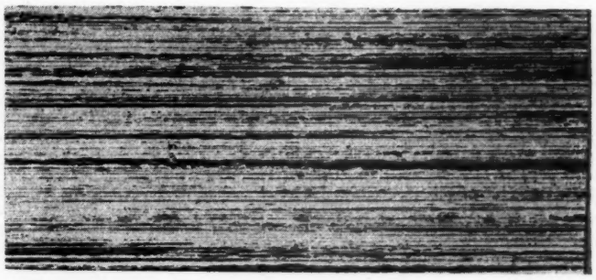
No. 2—Machined←, Rolled←



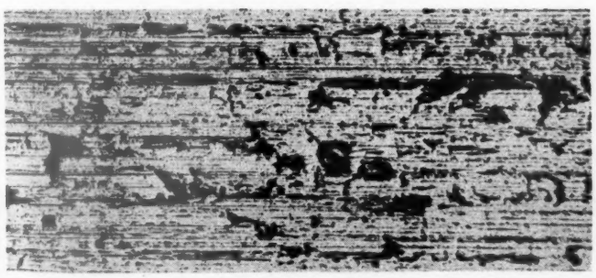
No. 4—Machined←, Ground←



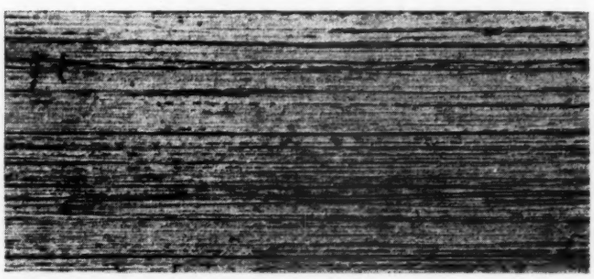
No. 2a—Machined←, Rolled←, Bearing←



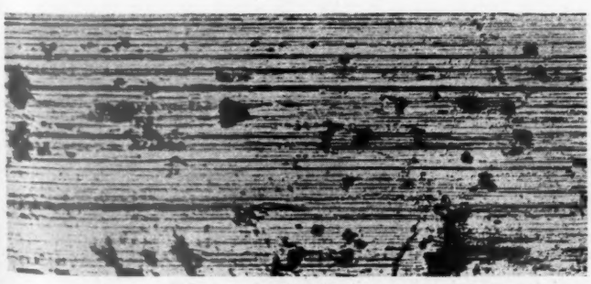
No. 4b—Machined←, Ground←, Bearing←



No. 3—Machined←, Rolled→



No. 5—Bearing after 50,000 miles of service



No. 3a—Machined←, Rolled→, Bearing←

**Microphotographs of the surfaces of journal bearings produced by all practical methods of machining.—The arrow indicates the direction in which the machining was done—The photographs were taken in order to learn what method of machining produced a bearing surface which would compare favorably with a bearing which had given satisfactory results at the end of 50,000 miles of service—100 diameters**

had been in service approximately 50,000 miles on a fast Mountain type locomotive, and was considered satisfactory for all practical purposes. We have produced in Bearing No. 4*b* a surface on a driving-wheel bearing that would compare favorably with this condition.

A check was made with micrometers of the surfaces of Bearing No. 2 and Bearing No. 5 to see if they conform to a true circle, and it was found that the surface of Bearing No. 2 varied as much as .002-in. in diameter, while Bearing No. 5 was a true circle the full length of the bearing with no flat spots or uneven places in it. It was thought that the irregularities in the surface of Bearing No. 2 resulted because it is necessary to use a high rolling pressure to get the required surface. The irregularities in the structure of the metal under rolling would produce the uneven surface on Bearing No. 2.

This investigation shows conclusively that a ground bearing surface is much smoother than the machined and rolled surface, and that it is a true circle, which is not produced with any of the other methods of machining. In shops that are not equipped for grinding journals, the surfaces should be finished as shown on Bearing No. 2, which is the next best method of machining, because the operations are performed in the same direction. Bearing No. 3 would not be considered good shop practice, as the machining and rolling have been done in opposite directions. This does not replace the broken ends of the metal in their original places, which leaves a very pitted surface.

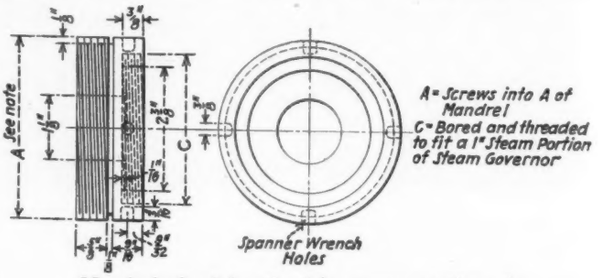
A rolled surface would not be considered as good as a ground surface, because the pits and microscopic cracks have been smoothed over and not removed. Under service conditions, these cracks and pitted places may become uncovered and leave a pitted surface as shown in photograph No. 3. It was also found that, when journals were trued by grinding, considerable less metal was removed than when the journal was turned and rolled. Grinding will greatly increase the life of the journals and materially reduce the cost of locomotive repairs.

## Combination Mandrel

*By E. G. Jones*

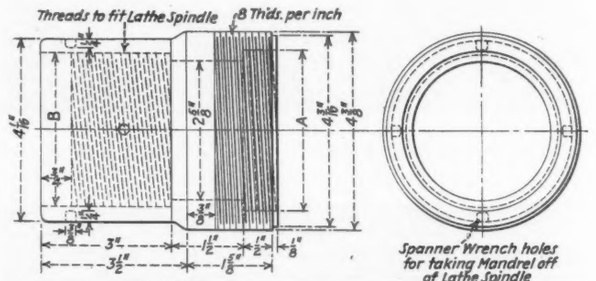
THE combination mandrel shown in the five sketches is one of the most useful lathe tools in our air-brake department where repair work is done in large quantities. Even in small shops such a mandrel can be a time saver where such repairs are made.

By substituting different glands it can be made to hold the steam portions of steam governors of various sizes where they are bored and trued up. Also, by substituting another gland it will hold the various sizes of air-compressor packing and retainer cups when being bored



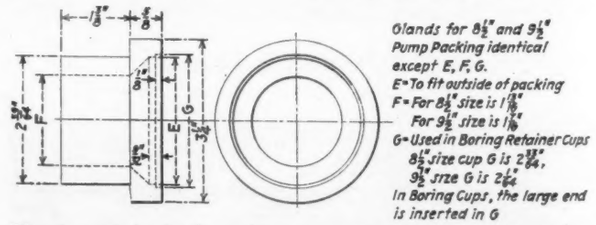

**Mandrel gland for the 1-in. steam portion of compressor governors**

to fit the piston. Other mandrels which are not shown may be added and applied to the master mandrel for various kinds of work.


Threads to fit Lathe Spindle
8 Thds. per inch
Spanner Wrench holes for taking Mandrel off of Lathe Spindle
Note: A = Diameter of 1½" Steam Governor Steam portion and threaded to fit same
B = Diameter of Lathe Spindle and threaded to fit same

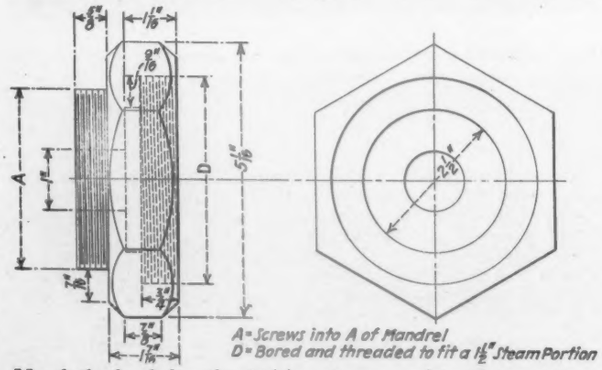
**Combination mandrel used for air-compressor packing and the steam portions of governors**

The master mandrel is applied to the lathe spindle and the mandrel suited for the particular kind of work to be

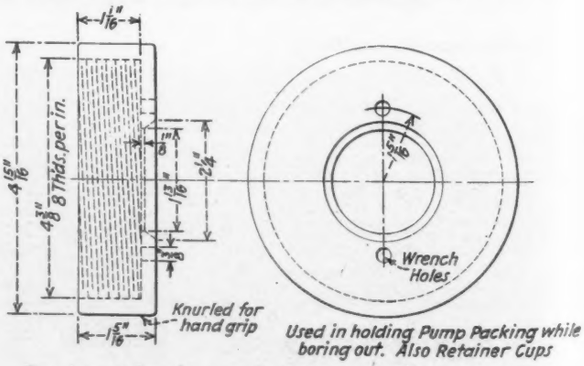

Glands for 8½" and 9½" Pump Packing identical except E, F, G.
E = To fit outside of packing
F = For 8½" size is 1⅞"
For 9½" size is 1⅞"
G = Used in Boring Retainer Cups
8½" size cup G is 2¹⁵⁄₆₄",
9½" size G is 2¹⁷⁄₆₄"
In Boring Cups, the large end is inserted in G

**Gland used in boring air-compressor packing and retainer cups**

bored is then applied to the master mandrel. This operation is simple and foolproof. It requires no alinement in the lathe and is ideal for production work.




**Mandrel gland for the 1½-in. steam portion of compressor governors**

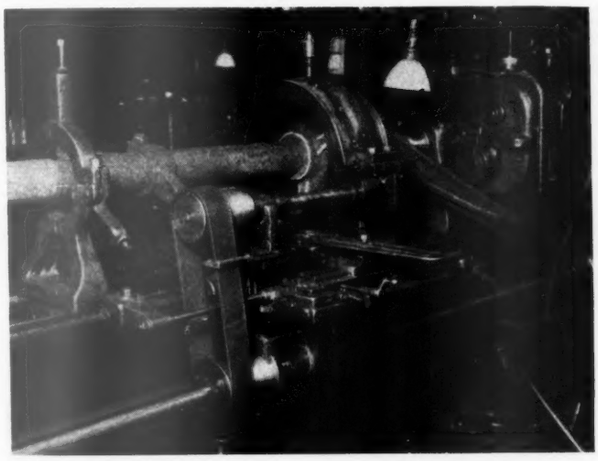



**Retainer collar for mandrel used in holding compressor packing and retainer cups while boring out**

The combination mandrel and glands are made of steel and finished as shown. The different glands screw into the head of the mandrel as shown in the sketches. The gland used in boring air-compressor packing and retainer cups fits into the mandrel. The packing or cup is inserted in the gland and clamped with the retainer collar.

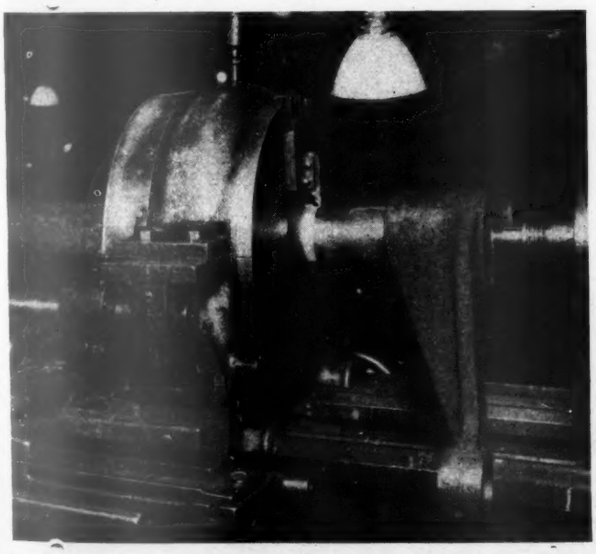
## Lift-Shaft Turner

NUMEROUS devices have been used for turning the end and center bearings on locomotive lift shafts without turning the shaft itself, with its large and heavy arm. This operation is handled at the Silvis (Ill.) shops of the Chicago, Rock Island & Pacific by



**Device used for turning lift-shaft bearings, used at the Silvis shops of the Rock Island**

means of a special lathe device, shown in two of the illustrations. The lift shaft is simply swung between the centers on a lathe and a rotating tool head and brass-lined bearing casting, made in two halves, is bolted around it. The cutting tool is held in a toolpost, capable of hand feeding into or away from the center of the



**View showing the rotating tool head and cutting tool turning a lift-shaft bearing**

shaft and carried in a revolving tool head which turns in the brass bushing in the bearing casting. This bearing casting is bored out 14 in. in diameter on the tailstock end, being large enough to receive any of the stops on the lift shaft and thus permit turning a bearing which may be located close to one of these stops. The drive is furnished by tight and loose pulleys from a splined drive shaft on the rear of the lathe, with a shifting lever conveniently located on the lathe carriage. Cross-feed is obtained by the usual lathe-carriage feed screw. The construction of this device is quite clearly illustrated. Its use permits turning lift-shaft bearings accurately and without the labor and time required to press off and on the lift arm or swing the entire shaft in a large engine lathe and turn the small bearings at slow speed.

## Piston-Valve Puller And Inspection Rack

THE removal of locomotive valves from the valve chambers often requires considerable effort because carbon accumulates between the packing rings and the walls of the spool, bull rings and followers. This accumulation does not permit the rings to compress sufficiently to allow the valve freedom of movement in positions other than its accustomed travel, thus causing it to stick when removing it from the valve chamber. As the present design of most locomotives makes it more or less difficult to get behind the valves to push them out or in front of them for pulling them out, the device shown in the drawing was designed to facilitate this work.

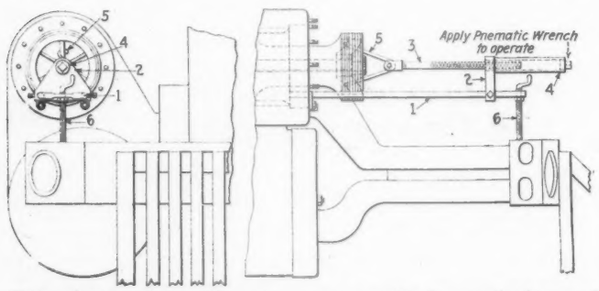
It consists of a rack or cradle, made of 1¼-in. round bar stock, which extends from the end of the front valve bushing to a point slightly beyond the back edge of the pilot beam and a threaded pulling rod, operated by a pneumatic wrench. The rack is so constructed as to form an elongated U, its width being equal to the horizontal spacing of the two bottom alternate studs of the valve chamber used for securing the front head to the chamber. Its length is governed by the distance between the cylinders and pilot beam of the locomotives on which it is to be used. The open end of the rack rests against the end of the front valve bushing in such a manner that the top of each leg is in line with the bore of the valve bushings proper, thus providing a convenient guide for the valve to slide on while either removing or replacing it, as well as a convenient place for resting the valve while inspecting it. The ends of the rack which set against the bushing are secured in alinement with the valve bushing by anchor lugs which engage the two bottom alternate studs on the front of the valve chamber. These lugs are welded to the rack after the cross member 2 has been slipped over the open ends of the rack.

The closed end of the rack is flattened horizontally to form a substantial seat for a 1-in. standard hexagon nut which is welded in position after a 1⅛-in. clearance hole has been drilled through the flattened portion of the rack. This nut engages with the spacing screw 6. This arrangement provides a quick vertical adjustment for maintaining the rack in a horizontal position on locomotives having various distances between the center line of the valve chamber and the top of the pilot beam, since the spacing screw 6 is the front support of the rack 1.

The cross-member 2, forged to the shape shown on the detail drawing, is 2 in. thick. Three holes are drilled in this piece as shown, the upper one through which the

1¼-in. pull rod passes being drilled 1$\frac{5}{16}$ in. while the two lower holes are drilled 1-9/32 in. to provide a sliding fit on the 1¼-in. round legs of rack 1. The two lower holes are fitted with two ⅝ in. Standard set screws for securing the sliding member 2 in any desired location on the rack 1. The vertical distance between the upper and lower holes is governed by the distance between the center of rack 1 and valve chamber.

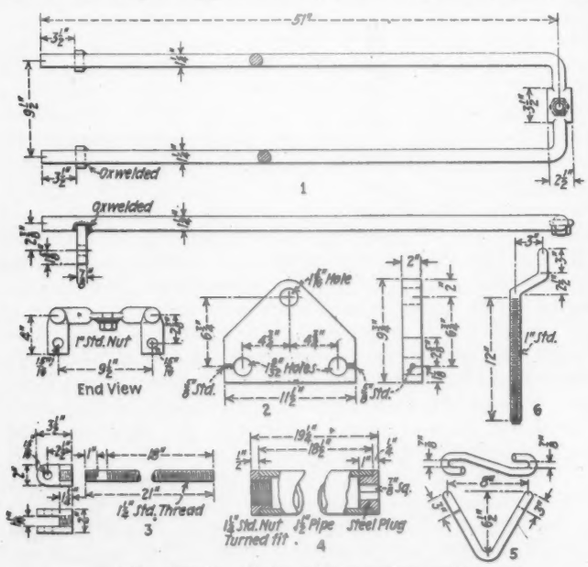
The pull rod 3, made of 1¼-in. round stock 21 in. in length, is fitted at one end with a clevis and hook 5 and at the other end with 18 in. of 1¼-in. standard thread to engage with the nut of the draw sleeve 4. The draw sleeve is 18 in. long and of 1½-in. double-strength pipe with outwardly beveled ends to form welding gaps




**This piston-valve puller serves as a guide for removing and replacing the valve and forms a rack for inspecting it**

for a 1¼-in standard nut and a steel plug, turned to a driving fit. The steel plug has a ⅞-in. square hole punched through it to engage the spud of a pneumatic wrench.

The hook 5 is used to couple the valve to the pull rod 3. It is made of 1-in. round steel, heated and bent to the shape shown, having a short hook on each leg bent outwardly in opposite directions. These short hooks




**The details of the piston-valve puller**

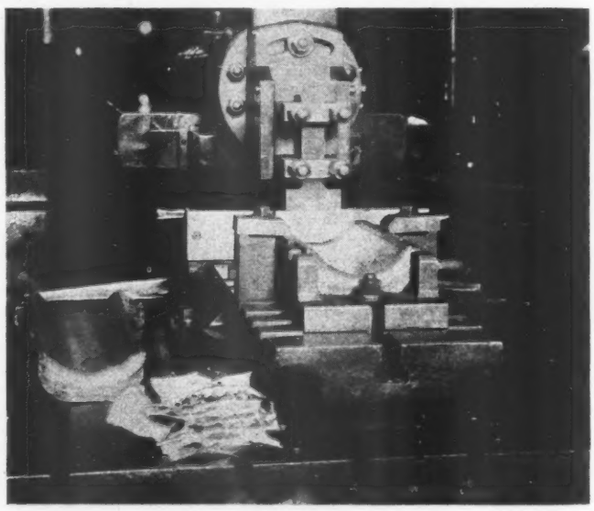
engage the two opposite spokes of the front follower or spider of the valve to be pulled, while the V-end engages with the ⅞-in. pin of the pull-rod clevis.

The spacing screw 6 is made of 1-in. round stock having about 12 in. of standard thread on one end while the other end is crank shaped so that it may be readily adjusted without a wrench. There will be found many cases of valve pulling where the use of the puller will not be necessary as the valves will yield to less pressure. In such cases, however, the use of the rack will be found to be of advantage as the cross-member 2 can be so adjusted to act as a fulcrum for a bar. The cross member can also be used when replacing the valve as it provides a short pinch for forcing the valve back into the bore, thus eliminating ramming the valve with a bar, a practice that is resorted to in some cases.

The rack 1 also forms a guide for the valve when replacing it in the valve chamber. The inspection facilities of this rack also permit the mechanic to turn the valve to any desired position without danger of having it roll off on the floor. Valve rings and bull rings are also exposed conveniently for calipering. In many cases of quarterly, semi-annually or annual inspections the valves will be found suitable for further service without attention but are not required to be replaced immediately. In such instances the rack is particularly convenient inasmuch as it affords a safe harbor for the valve until such time as is desired to replace it.

## Broaching Tender Brasses

AT the Silvis (Ill.) shops of the Chicago, Rock Island & Pacific, new engine truck and tender brasses are given an accurate and smooth surface bearing by broaching with a single stroke in the heavy-duty shaper, illustrated. Second-hand brasses are hammer-tested for looseness, examined for cracks, and, if not excessively worn, broached in the same manner. Re-



**Holding fixture and cutter arrangement for broaching engine-truck and tender brasses at the Silvis shops**

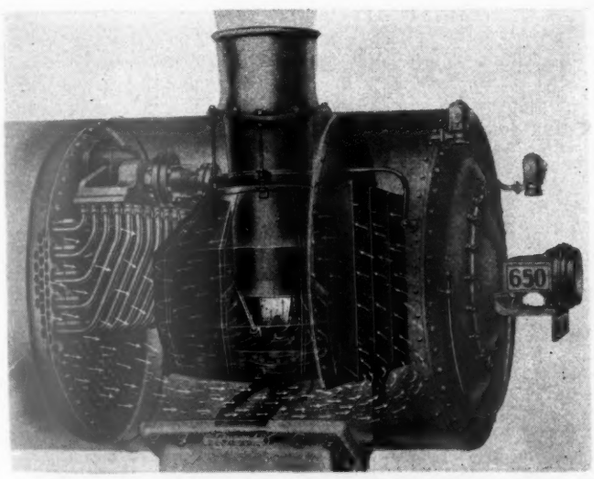
lined, or rebabbitted brasses, also, are broached, one at a time, using the fixture shown, with a simple clamping arrangement and the flange of the brass fitting in a slot in the fixture to take the end thrust. A circular cutter made of carbon steel, hardened and ground to the proper size in a cylindrical grinding machine, is held in the tool holder of the clapper box. The brass-holding fixture is properly centered and three to five strokes taken, as necessary, to true up the surface. The result is a true, smooth surface, which fits the journal accurately, it is free from any possible inclusion of abrasive particles and, consequently, has a minimum tendency to run hot and cause locomotive delays.

# NEW DEVICES

## Cyclone Spark Arrester

FOR a number of years, the Northern Pacific has been using Rosebud coal successfully on locomotives, this light lignite, secured from a large strip mine in eastern Montana, burning freely but being readily drawn to the smokebox and out of the stack. To find some means of burning this coal without attendant fire hazards, the Northern Pacific began experimenting, about two years ago, with a front-end device which depended upon centrifugal action rather than netting to prevent the emission of live sparks from the locomotive stack. This device was developed by M. F. Brown, general fuel supervisor of the Northern Pacific, and called the Cyclone spark arrester. It is now being manufactured by the Locomotive Firebox Company, Chicago, and is applied to about 300 locomotives on the Northern Pacific. A number of other roads are also making applications.

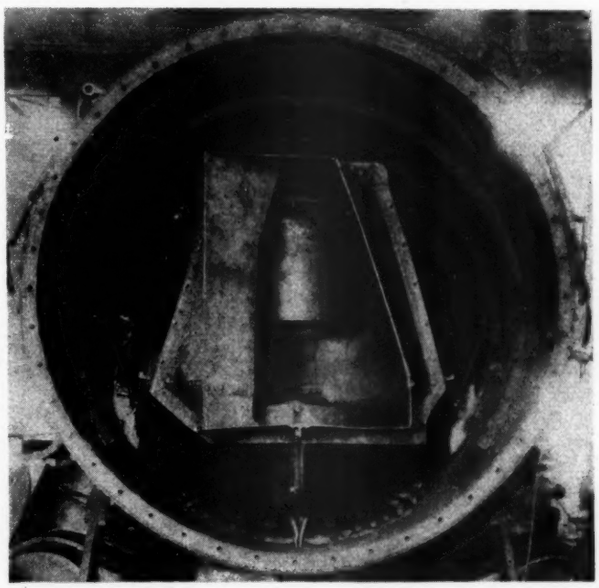
Extensive tests on the Northern Pacific, including two conducted by the Forestry Department of the United States Department of Agriculture, indicate that the new spark arrester prevents any sparks leaving the stack of sufficient size to start a fire on the right of way, even in hot summer weather and with low relative humidity. This seems to be equally true under any load




**Phantom view showing the construction and operation of the cyclone spark arrester**

and firing conditions from minimum to maximum. Besides functioning without front-end netting, a valuable feature of this spark arrester, as also shown by the tests, is that it can be used without paying any penalty in decreased efficiency due to higher cylinder back pressure. In fact, with this type of spark arrester, as compared to the standard Master Mechanic's front-end design, a slightly larger exhaust nozzle can generally be used. In addition to promoting the safe burning of light lignite as well as heavier coals on coal-burning locomotives, the new spark arrester is said to be equally adaptable to use on oil burners to prevent the emission of sparks produced from particles of firebrick and carbon deposits which become detached and overheated.

The Cyclone spark arrester consists of a large sheet metal drum which surrounds the smoke-stack extension and the nozzle tip, and carries at the sides and tops vertical baffle plates. The intake is also provided with deflectors so arranged that when a locomotive is working the gases and cinders enter the drum in a tan-



**Cyclone spark arrester installation with one of the deflector vanes removed to show the interior arrangement**

gential direction and continue in a circular movement throughout the drum. Centrifugal force carries the cinders to the wall of the drum where they are broken up by friction, ground to the size of coarse sand and extinguished in the gases which fill the drum. Gradually, the cinders work down to the bottom of the drum and, when small enough, are picked up and carried out of the stack in the usual manner.

### Wire Netting Not Used

As indicated, wire netting, or perforated plate, is not used in connection with the Cyclone spark arrester, this being a fundamental divergence from the standard practice, as netting in one form or another is commonly depended upon to prevent the emission of sparks from locomotive stacks. Owing to the absence of netting, there is no possiblity of holes developing through which large sparks can pass and cause fires, nor is there any chance of clogged openings, with reduced effective air space and attendant possibility of steam and engine failures. The size of the drum in the new spark arrester is so related to the cross section of the flue area that there is no restriction of the draft of the locomotive.

The Cyclone spark arrester is designed with solid plates, made in sections, which can be removed to facilitate necessary repairs to flues or superheater units. Ease of inspection is an important feature, there being no necessity to look for small holes in a netting or around

*(Continued on next left-hand page)*

the plates, as in the standard Master Mechanic's front end. The cost of inspection, as well as maintenance, is, therefore, minimized.

## Armite Arcweld and Hard-Surface Products

A GROUP of hard-facing products for application on friction surfaces have been developed by Armite Laboratories, 318 West Ninth street, Los Angeles, Calif. These are for application with the electric arc and by the oxy-acetylene process. The laboratory has developed several grades of inserts and compounds ranging in size from the smallest 20-mesh to ½-in. diameter for application to drilling bits, power-shovel teeth and for other services where inserts are desirable.

The company has also developed a product which is a tungsten-carbide compound that can be applied directly to any type of steel and by special application to manganese. The product, known as Armite Arcweld, is applied with an electric arc using a negative carbon electrode. The same material in tube form, known as Armite Autoweld, is also being introduced.

The laboratory, in addition to manufacturing materials of diamond-like hardness, has also developed a hard-facing rod of light weight for covering a large area per pound. This hard-facing rod is made in three grades of varying hardness.

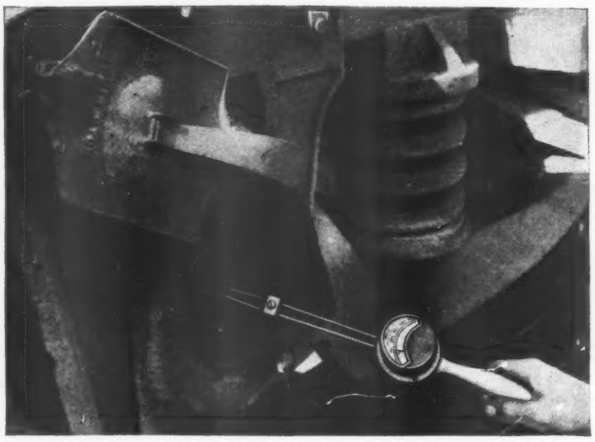
## Hot Bearing Indicator*

A PORTABLE indicating pyrometer, recently developed and placed on the market by the Illinois Testing Laboratories, Inc., Chicago, is now being used in detecting hot bearings on locomotives and rolling stock, as well as for a number of other purposes in railway service.

This instrument, called the Pyro Prod, consists of a highly sensitive, yet rugged, millivoltmeter, to which is attached a pair of pointed thermo-couple wires. When the points of these wires are pressed against the bearing, the bearing metal completes the circuit and this causes a small flow of electric current to the indicator. This flow of current increases with the increase of temperature and causes the point of the millivoltmeter to deflect over a scale which is graduated in degrees Fahrenheit. Almost instant readings are obtainable, as it is merely necessary to make contacts between the pointed thermo-couple wires.

The Pyro Prod can be furnished in several different temperature ranges, but the one most generally used for bearing work is from 0 to 600 deg. F. When desired, the Pyro Prod is furnished with an automatic internal cold-end compensator. This is important where the instrument is to be used out-of-doors and subject to wide changes of atmospheric temperatures. Other models of contact-type pyrometers can also be furnished for measuring the surface temperature of other metals such as heated billets, rods and rails.

When used on locomotives, the Pyro Prod is carried in the cab and at each stop the engineman takes the instrument and goes from one bearing of the locomotive and tender to another, quickly checking the temperatures and eliminating all guesswork as to whether or not excessive temperatures are being developed, with consequent possibility of train delay. The instrument has also been used in connection with the heat treating of rail ends after application to the track by heating with an oxyacetylene torch and subsequently quenching from the correct surface temperature as determined by the Pyro Prod.



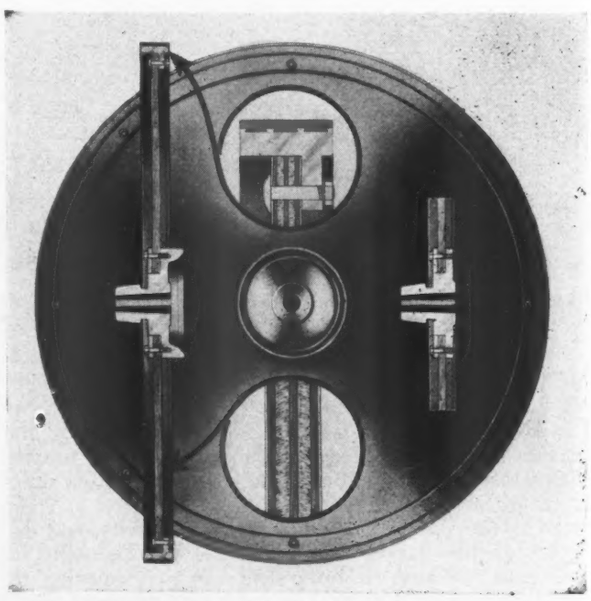
**Convenient and accurate indicating pyrometer used to show the temperatures of a hot journal bearing**

* This device was described on page 662 of the November, 1930, issue of the *Railway Mechanical Engineer*.

## Demountable Rim For Band Saws

THE Oliver Machinery Company, Grand Rapids, Mich., recently brought out a band-saw wheel designed as a steel-clad, five-ply laminated disc fitted with a demountable rim. The rim is made of aluminum,

*(Continued on next left-hand page)*



**The Oliver demountable band-saw rim—The top insert shows the details of the rubber-faced tire and method of mounting the rim—The lower insert shows the construction of the laminated disc wheel**

# Don't build a MODERN Locomotive from OBSOLETE MATERIALS

ACATHON STEELS
TRADE MARK

ONLY A few years ago, locomotive materials were confined to plain carbon steel, wrought and cast iron.

● But the modern locomotive, with its higher pressures, increased speeds and greater loads, now has a wide variety of alloy steels to draw upon, many of them developed by Republic metallurgists for the specific set of conditions they must meet.

● Today, higher boiler pressures have brought the Agathon steel boiler shell and the Agathon Alloy steel staybolt.

● Tubes are made of seamless, corrosion-resisting Toncan Iron; pins and bushings of Agathon Nickel Iron; still other special alloy steels go into rods, motion work and axles.

● Modern locomotives have their counterpart in modern materials. You wouldn't build a locomotive that is obsolete in design. Don't build one of obsolete materials. Consult with Republic metallurgists on the steels that best suit each condition of railroad service.

REG. U.S. PAT. OFF.
TONCAN
COPPER
Mo-lyb-den-um
IRON

CENTRAL ALLOY DIVISION
REPUBLIC STEEL
CORPORATION
Massillon, Ohio

a rubber tire being ground to a perfect circle and vulcanized into dovetailed grooves in the aluminum rim. The rubber used has a high zinc oxide content vulcanized on a hard rubber base which in turn is vulcanized into the grooves.

The demountable rim is designed for high-speed production and can be mounted on any 36-in. band saw. It was developed to eliminate the older method of stretching and cementing a rubber tire on the wheel and to reduce to a minimum the danger of breaking the rubber or not getting it to stick and the delays resulting from such practice.

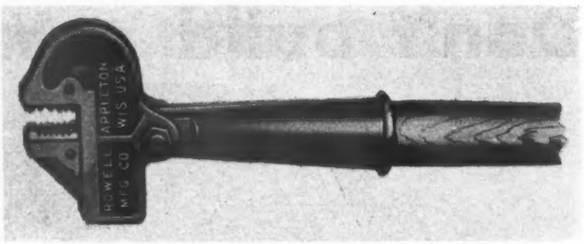
## Rowell Car Mover and Wrench For Hopper Bottom Cars

IN ONE of the illustrations is shown a car wrench made by the Rowell Manufacturing Company, Appleton, Wis. for opening drop or hopper bottom cars. It is designed with a swiveling head so that it can be operated at all angles with the hopper or releasing shaft, if

**The Rowell car mover which develops a high rotating power at the car wheel**

there are any obstructions on the car to prevent the wrench securing its grippage at right angles with the shaft.

The wrench is built from tested materials and is designed to withstand a handle load of 850 lb. before breakage of any part ensues. Its construction and leverage is such that the force applied to the handle is multiplied 27 times at the jaw. When using the wrench on drop or hopper-bottom cars, the jaws automatically close in on the shaft as soon as pressure is applied to the handle. The jaws are designed with teeth which insure the wrench from slipping as long as pressure or weight is applied on the handle. When the trip or pawl of the




**The Rowell car wrench for opening drop- and hopper-bottom cars**

hopper doors is released, it is only necessary to remove the weight from the handle when the jaws will open and permit the tap or shaft to spin without endangering the operator.

The overall length of the wrench is 54 in. and its total weight is 18 lb. The jaws open to a maximum width of 2¾ in. and close to ¾ in.

The other illustration shows a rocker-bearing car mover which is designed to develop a high rotating power at the car wheel through co-ordination of the two principles of compound leverage and rocker-bearing movement. The rocker-bearing is constructed so that it works automatically in conjunction with the compound leverage. The car mover is fitted with two spurs which grip the rail when it is in a stationary position, this feature being used to eliminate slipping and to insure a positive grip on the rail. Each of the spurs has four sharp cutting edges so that when one edge becomes dull another is available. The spurs are made of high-carbon tool steel and are tempered and drawn. The handles are turned from selected rock maple wood.

## Helical Cutter For Milling Side Rods

THE O. K. Tool Company, Inc., Shelton, Conn., has extended the application of the O. K. taper serrated cutter blades to include wide-face interlocking helical milling cutters.

The illustration shows a pair of such cutters milling

*(Continued on next left-hand page)*

**A pair of O. K. helical milling cutters milling the round ends of a pair of side rods**

# Super-Power is EARNING its Way

■ WITH falling traffic, roads which have recently purchased Lima Super-Power locomotives have a distinct advantage.

■ These roads are effecting substantial economies by concentrating as much of their road work as possible on the newer, more efficient power. Old, high-operating-cost locomotives are "white-leaded".

■ At this time, when economy is most important, Super-Power is earning its way and justifying the foresight of railroads having a progressive motive power policy.

■ Now is the time to be working on new power, because you can't afford to return the old locomotives to service when business improves.

---

## LIMA LOCOMOTIVE WORKS

INCORPORATED

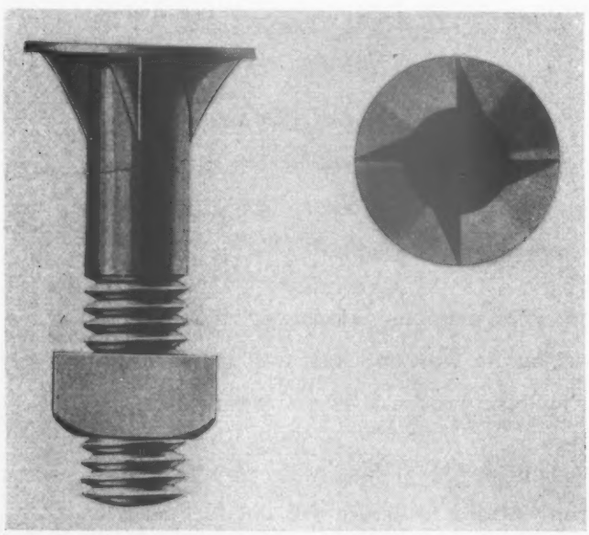
LIMA — LIMA LOCOMOTIVE WORKS INCORPORATED — OHIO

the round end of a side rod. The O. K. cutter blade is retained in the cutter body by its taper serrated shape, no other means being required to retain it in position. The serrations allow the blade to be moved outwardly for regrinding, a true helix being milled across the face of the cutter to give it a constant rake angle. The body is drop-forged of alloy steel. The cutters can be furnished singly or may be interlocked together to form slab milling cutters of any width.

The blade, which is tapered and has a serrated back, fits into a corresponding slot in the body. The tapered surface locks the blade securely in the body without the aid of any screws, taper pins or split body construction. The serrations permit the blade to be adjusted for wear. The blades, which are of drop-forged, high-speed steel, have a superior cutting edge, the forging operation refining the grain structure of the steel. The blade is hard and heat resisting while the body is tough and strong.

## The Lewis Seal-Tite Bolt

THE Lewis Bolt & Nut Company, Minneapolis, Minn., recently placed on the market its Seal-Tite bolt which is designed with several features which make it adaptable wherever wood construction is a factor, especially for smooth lining and decking on box-car equipment. The bolt is equipped with four fins on a shank



**The Lewis Seal-Tite bolt for smooth lining and decking of box car equipment**

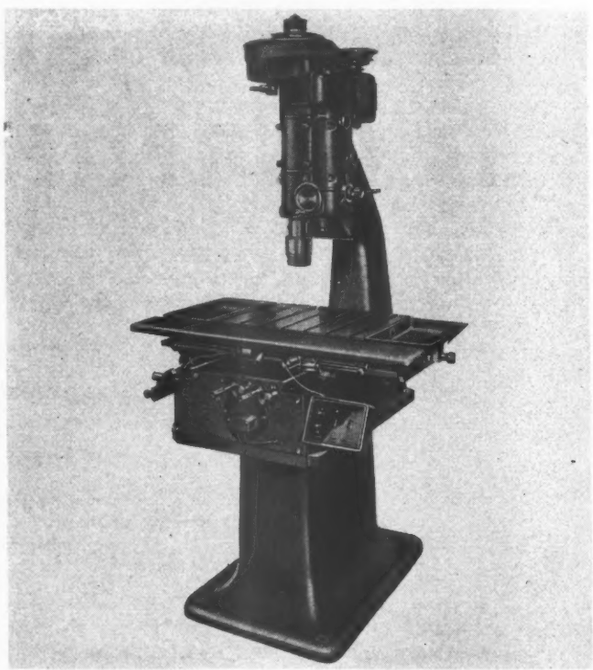
beneath the head which serve to hold the bolt from turning and which are so designed that the surface of the fin bearing against the wood in tightening is on a radial plane. The effect of this action is to produce the maximum holding power against turning and to eliminate the splitting action of a counter-sunk square-head bolt.

The tensile strength of the head has been found under test to be slightly higher than 50,000 lb. per sq. in., while being sufficiently thin to countersink flush with the surface of the wood. The head is designed so that the pressure of its tapered surface against the wood fibre will produce a water-tight connection. The bolts, which can be driven into the wood with an ordinary hammer, are available in sizes ranging from ¼ in. to ¾ in. in diameter, with lengths running from 1 in. to any size desired.

## The Kellocater Jig Boring Machine

IN the illustration is shown a machine designed for fast precision jig boring and layout work. It was designed by the Keller Mechanical Engineering Corporation, 70 Washington street, Brooklyn, N. Y., to reduce dependence on human skill and to cut down chances of mechanical error. The only measuring devices on the machine are two vernier scales, one of which measures longitudinal movement while another measures transverse movement only.

Settings are made without moving the work or the table by lining up two sharply drawn graduations, one on the scale and the other on the vernier. Reading is



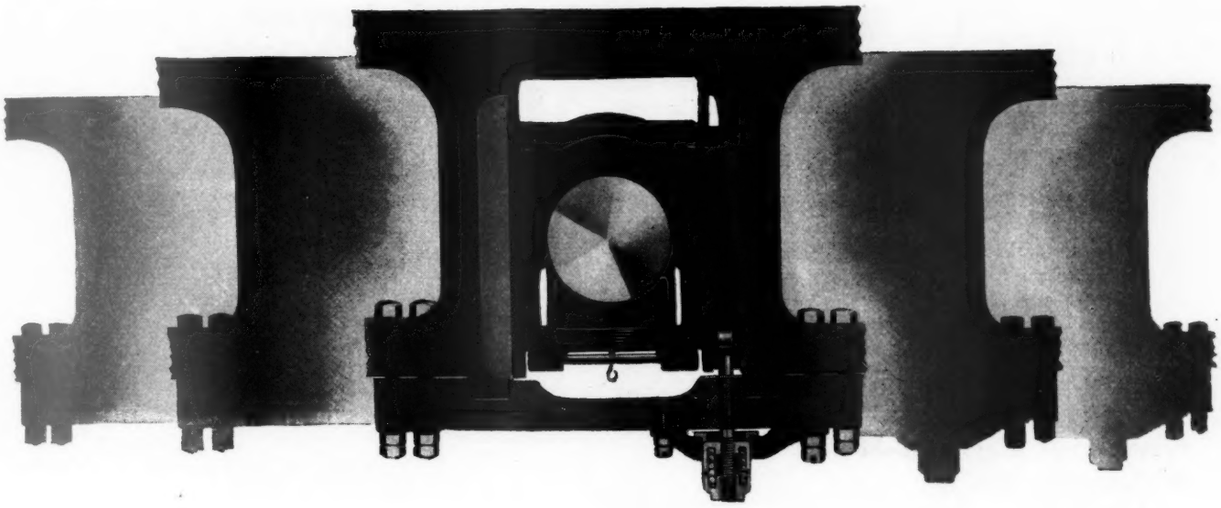
**The Kellocater jig boring machine**

done through a magnifying glass equipped with a built-in electric light. In connection with setting, an adjustable screw is provided so that the scale and vernier can be lined up to the nearest even inch. The machine is equipped with an automatic electric stop and a toggle switch which moves the work at a uniform speed by means of a magnetic clutch-driven lead screw. As the contact fastened to the table touches the anvil of the vernier slider, the magnetic clutch releases the lead screw and the table stops in location within an accuracy of .0002 in.

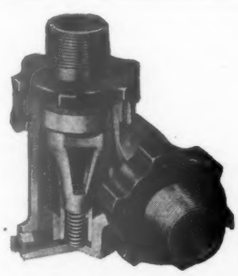
The machine is equipped with a recently developed lock which is designed to prevent slippage of the table over an oil film, thereby keeping the accuracy of the setting intact. The machine is designed so that it will bore one hole while setting up for the next, by using the automatic reversible spindle feed.

The machine is fitted with an extra-heavy spindle, made of chrome-nickel steel, which runs in ball bearings. Spindle speeds range from 77 r.p.m. to 1,750 r.p.m., four through open belt and four through back gears. It also has two reversible automatic feeds, .002 in. and .005 in., and a choice of hand-wheel and hand-lever feeds. An automatic depth-stop feed, with a scale

*(Continued on next left-hand page)*



# AN AUTOMATIC GUARDIAN OF WEDGE ADJUSTMENT



THE FRANKLIN SLEEVE JOINT

A reliable conduit, free from limitations in movement, permitting short vertical pipes and greater rail clearance.

WEDGE ADJUSTMENT controls the life of brasses and bushings. If slack can be kept out, their life will be prolonged.

To do this requires a change of wedge adjustment as boxes heat up in service. Ordinary wedges even if properly set when cold cannot be right when the engine is at working temperature.

Only Franklin Automatic Adjustable Wedges can keep wedge adjustment always right and thus bar out slack.

Franklin Wedges adjust themselves with every turn of the driver, providing for expansion as temperatures increase.

They protect the foundation of the locomotive and keep maintenance in check.

## FRANKLIN RAILWAY SUPPLY COMPANY, Inc.

NEW YORK CHICAGO ST. LOUIS SAN FRANCISCO MONTREAL

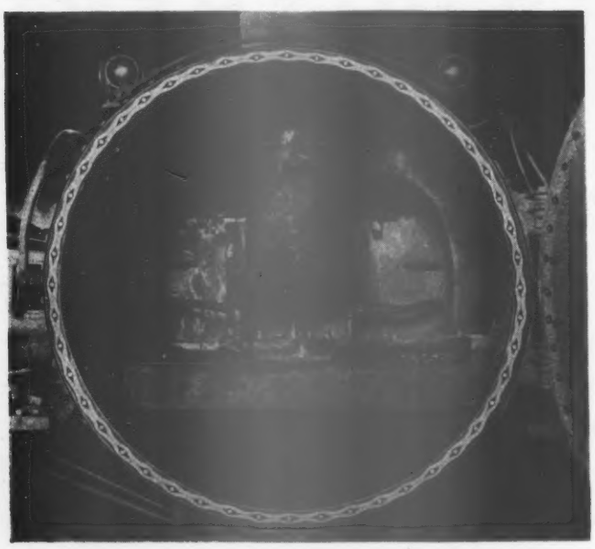
and a pointer, is attached to side of the spindle head.

The driving mechanism, including the magnetic clutch, is enclosed and protected in a box-shaped bed. The spindle motor is mounted on a hinged bracket adjustable for belt tensioning. The base and over-arm of the machine are of rigid design and the latter is gibbed and furnished with a crank for a vertical adjustment of 6 in.

Specifications of the machine include: Horizontal table travel, 18 in.; transverse table travel, 12 in.; table working surface, 14 in. by 21 in.; table top to spindle end, 2½ in. min. to 14½ in. max.; distance between spindle center and face of column, 14 in.; spindle motor, ½ hp.; vertical adjustment of spindle bracket, 6 in.; spindle-quill travel, 6 in.; weight, 1,375 lb.; dimensions, 55 in. by 45 in. by 78 in. high.

## Garlock Button-Hole Asbestos Tape

THE Garlock Packing Company, Palmyra, N. Y., recently placed on the market an adaptation of asbestos tape for use on locomotive front ends and on flanged tanks of large diameters. The tape consists of parallel courses of Garlock folded asbestos wire-inserted cloth joined together by a single ply of bonding fabric.



**The Garlock 616 button-hole tape applied to a locomotive front end**

As shipped from the factory it contains no holes. The insertion of a knife blade between the parallel sections of the tape cuts the bonding fabric, forming a button hole which slips over the bolt or stud. The tape was designed so that a workman with no tools, other than a knife, can form a gasket which will remain in place, fit correctly, lay flat and form a seal around every bolt.

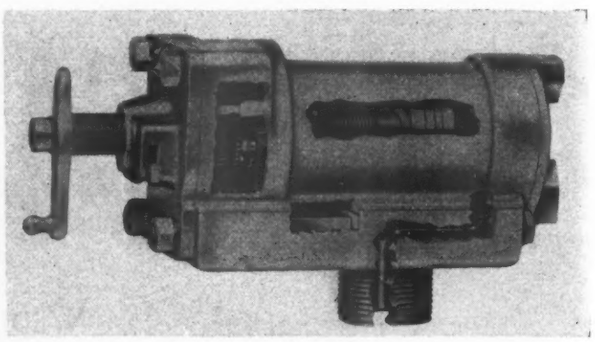
Ordinarily the button holes are cut as the tape is applied to avoid waste and possibility of errors in measurement. The tape is furnished printed with 1-in. graduation marks in case it is desirable to cut the holes at a work bench before applying it to a flange.

The tape, designated as the Garlock 616 Button-Hole Tape, is manufactured in coils of any desired length and in all regular widths and thicknesses. A typical application of the button-hole tape to the front end of the locomotive is shown in the illustration.

## Automatic Inertia Crank Pin Lubricator

MULTI-SELECTO Phonograph Inc., Railroad Division, Grand Rapids, Mich., recently brought out what it designates as the Automatic Inertia lubricator which is designed to provide constant and positive lubrication for crank pins and valve motion pins.

The lubricator is installed by securing a threaded shank, cast integrally with the cylinder, into the rod directly above the pin and is locked against rotation by the use of a lock plate. The lubricator is 6½-in. long, 3¼ in. wide and 4 in. high and consists of a cylinder and an oblong metal box which contains a weight connected, through the medium of a bell crank, to a pawl carrier and pawl. The pawl engages a ratchet, which has an eccentric on one face. This eccentric is surrounded by a second pawl carrier upon which is pivoted a second pawl which engages a second ratchet threaded internally to conform to the threads on a feed screw. The screw



**The automatic inertia lubricator for lubricating crank pins and valve motion pins**

is fitted with a brass cup and piston of the same diameter as the inside of the cylinder and is slotted lengthwise to within ½ in. of its outer end. This slot prevents rotation of the feed screw until the lubricator is empty, through being engaged by a pawl or trigger pivoted to the cylinder casting. Upon reaching the end of this slot the pawl, or trigger, is automatically disengaged, thus allowing the feed screw to rotate and preventing damage to the lubricator through jamming.

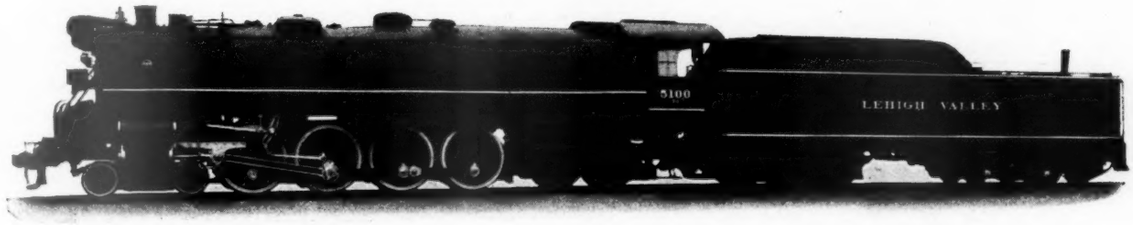
The lubricator is operated by the rotation of the pin, or rod, causing the weight to slide longitudinally backward and forward in its chamber. The amount of this slide or travel is determined by the pitch of the teeth on the eccentric ratchet, this ratchet being connected to the weight by the bell crank and pawl. It follows that one revolution of the locomotive wheel is equal to one tooth on the eccentric ratchet and one revolution of the eccentric ratchet equals one tooth on the threaded or driving ratchet. The amount of grease fed to the pin can be controlled by either increasing or decreasing the number of teeth on the ratchet or the threads on the feed screw, or both, thus making it possible to apply the Automatic Inertia lubricator to any size pin. Recent tests run with the lubricator are said to have revealed the fact that when applied to a 72-in. wheel, it ran 850 miles per filling.

---

ONE HUNDRED YEARS AGO.—The South Carolina (now part of the Southern) on April 5, 1831, operated the first locomotive with a four-wheel engine truck. The locomotive hauled four cars with 117 passengers, 2.75 miles in 11 minutes.

*(Continued on next left-hand page)*

# *To Speed Up Freight Traffic On The Lehigh Valley*




4-8-4 TYPE LOCOMOTIVE
Class T-1
LEHIGH VALLEY RAILROAD
J. P. LAUX
Superintendent Motive Power

| | |
|---|---|
| Cylinders | 27" x 30" |
| Drivers, diameter | 70" |
| Steam pressure | 250 lb. |
| Grate area | 88 sq. ft. |
| Water heating surface | 5422 sq. ft. |
| Superheating surface | 2256 sq. ft. |
| Weight on drivers | 270,000 lb. |
| Weight, total engine | 408,000 lb. |
| Tractive force, main cylinders | 66,400 lb. |
| Tractive force, with booster | 84,760 lb. |

THE LEHIGH VALLEY, while an important anthracite carrier, also handles a heavy tonnage of merchandise and perishable freight, which moves on fast schedules.

In accordance with a long-established policy of improving the service in every possible way, the road ordered from us a trial locomotive of the 4-8-4 type, which is now in service. This locomotive is specially designed to handle on a fast schedule, a load of 3000 tons from Buffalo to tide-water, with the assistance of a helper on the Mountain Cut-off near Wilkes-Barre, where the grade is 60 feet per mile.

Lehigh Valley engine 5100 is typical of the strictly modern fast freight hauler — with large drivers, high steaming capacity, and a design that insures maximum output in ton-miles per hour, with a minimum charge for fuel, supplies and maintenance.

THE BALDWIN LOCOMOTIVE WORKS ★ 1831 1931

**THE BALDWIN LOCOMOTIVE WORKS**
**PHILADELPHIA**

# Among the Clubs and Associations

NEW ENGLAND RAILROAD CLUB.—The annual banquet and entertainment of the New England Railroad Club will be held in the ball room of the Copley-Plaza Hotel, Boston, Mass., at 6:30 p.m., daylight saving time.

WESTERN RAILWAY CLUB.—The election of officers and directors and the annual dinner and entertainment of the Western Railway Club will take place on May 22 at the Hotel Sherman, Chicago. The dinner will be at 6:30 p.m. and at 8 p.m. the Reverend Ernest S. Tittle of the First Methodist Church, Evanston, Ill., will speak on Creative Life.

CAR FOREMEN'S ASSOCIATION OF OMAHA, COUNCIL BLUFFS AND SOUTH OMAHA INTERCHANGE.—The cleaning of passenger car equipment will be the subject discussed by H. E. Moran, general car foreman of the Chicago Great Western before the meeting of the Car Foremen's Association of Omaha, Council Bluffs and South Omaha Interchange to be held at Council Bluffs, Iowa, at 2 p.m. on May 14. The election of officers will also take place at this meeting.

TORONTO RAILWAY CLUB.—The Toronto Railway Club, organized at Toronto, Ontario on March 13, has already enrolled 869 members. Meetings are to be held on the third Monday of each month, excepting June, July and August. The officers of the club are: President, T. C. Hudson, general superintendent, Canadian National; first vice-president, R. McKillop, superintendent, Canadian Pacific; second vice-president, H. T. Malcolmson, vice-president, Toronto, Hamilton & Buffalo; treasurer, G. H. Davis, assistant district engineer, Canadian Pacific; secretary, J. A. Murphy, assistant to the general superintendent of the Canadian National, Toronto.

FIFTH OIL POWER CONFERENCE.—The fifth oil power conference, under the joint auspices of the Pennsylvania State College and Lubrication Engineering Committee of the Petroleum Division, American Society of Mechanical Engineers, will be held on Friday, May 22, at the Pennsylvania State College, State College, Pa. R. L. Sackett, dean of engineering at State College, will preside at the morning session, at which E. G. Boden, engineer, and O. L. Maag, oil chemist, of the Timken Roller Bearing Company, will discuss lubricant testing. L. J. Bradford, professor of machine design at State College, will present a paper on Bearing Design in the Light of Oil Film Pressure Investigations, and F. O. Willhofft, secretary and general manager of the Isothermos Corporation of America, will present a paper on Fluid Film Lubrication as Applied to Railroad Journal Bearings. There will also be an Oral Discussion of Lubrication of Railway Bearings, by M. E. McDonnell, chief chemist, Pennsylvania Railroad. At the afternoon session there will be a Symposium on Internal-Combustion Engine Lubrication with Lubricants from Coastal Crudes, Pennsylvania Crudes, and Midcontinent Crudes, the session being presided over by J. G. O'Neill, chief chemist, U. S. Naval Engineering Experiment Station, Annapolis, Md.

## Club Papers

### Chilled Car Wheels

*New York Railroad Club.*—Meeting held at the Engineering Auditorium, 29 West 39 street, New York City. Paper by G. E. Doke, president of the Association of Manufacturers of Chilled Car Wheels. ¶In his address, which was illustrated by slides, Mr. Doke showed the location of the 58 factories in the United States and Canada which are producers of chilled car wheels. He discussed the history of the development of the chilled car wheel and the manufacturing methods used today. Mr. Doke's paper was followed by a motion picture which showed the successive steps in the manufacture of chilled car wheels.

### The Foreman's Relation to His Men

*Toledo Car Inspection Association.*—Meeting held at Hotel Secor, April 14, 1931. Papers by W. Laub, Pennsylvania shop foreman, and by G. E. Doke, president of the Association of Manufacturers of Chilled Car Wheels. ¶Mr. Laub discussed in his paper the forman's relations to his men and related the change which has taken place in the requirements for the position of foreman. Formerly, he stated, it was the man with strong physique who could, by his strength and persuasiveness, control the action and energies of his men. Today, however, the forman's greatest objective is to secure co-operation, Mr. Laub stated, rather than to force output by any physical characteristics. ¶Mr. Doke's paper, illustrated by slides, discussed the history and the present day methods of manufacturing chilled car wheels. It was followed by a motion picture showing the various steps in the manufacture of the wheels. ¶A complete entertainment program was furnished by the Wine Railway Appliance Company of Toledo.

### The Coffin Feedwater Heater System

*The Southern and Southwestern Railroad Club.*—Meeting held March 19 at Atlanta, Ga. Paper by C. W. Wheeler, The J. S. Coffin, Jr., Company, Englewood, N. J., on the subject, "The Coffin Feedwater Heater System and Its Relation to Feedwater Heating." ¶Mr. Wheeler's paper gave a complete description of the Coffin Feedwater heater system consisting of a main closed type heater, an auxiliary open type heater, a centrifugal type boiler feed pump, a control valve and miscellaneous fittings and connections. ¶In his paper Mr. Wheeler stated that "In a recent Frisco endurance test run of thirty-one days duration, no work of any description was performed on the Coffin system. The system operated perfectly and temperatures averaging 210 deg. F. were obtained for the entire run of 9,700 miles. As this test was conducted in one of the recognized bad-water districts of the United States, it proves the practical adaptability of operating the closed heater unit of the Coffin Feedwater heater system in bad water districts." ¶The paper was accompanied by slides which showed various applications of the Coffin feedwater heater, and views of the individual units of the system and diagrammatic sketches of them.

### Car Men Discuss Supplies

*Car Foremen's Association of Chicago.*—Meeting held April 13 at Chicago. Address by J. G. Stuart, general storekeeper, Chicago, Burlington & Quincy, on the problem and importance of securing co-ordination between the car and store forces in meeting the requirements for material and reducing maintenance equipment. ¶Mr. Stuart emphasized the fact that both departments have a joint responsibility to work harmoniously. ¶The two departments must co-ordinate their efforts, he advanced, and the development of a feeling of mutual respect is essential to the purpose. When this respect is lacking, he contended, there can be little or no co-operation. In the interest of conserving material, Mr. Stuart pointed out that car department foremen must realize that a dollar spent for material is as large as a dollar spent for labor, and he developed the thought that a foreman who is willing to help the storekeeper is correspondingly helping himself and the progress of his work. ¶He advocated assigning to stores forces the work of delivering all car material, adding that this procedure would save the time of car forces as well as material. "There are still some car foremen who do not know as much now as the ordinary bricklayer knew 50 years ago," said Mr. Stuart

(after explaining how the bricklayer confines his attention to laying brick and depends upon the hodcarrier to provide the material), "but when they do learn, they will not only want material delivery but they will demand it." ¶ Over 300 car supervisors attended the meeting.

### Manhattan Air Brake Club

*Manhattan Air Brake Club.*—Meeting held in Room 2300, 150 Broadway, New York, February 20, 1931. ¶The following subjects were discussed at the February meeting of the Manhattan Air Brake Club: Gaskets—Is it a general practice to recondition used gaskets? What success is had with reconditioning and what methods are used? Are used gaskets replaced without reconditioning? How is it determined when a gasket should be scrapped? Quadruplex air gages; trailer and truck brakes on steam locomotives; Electro-Tite hose fittings; piston valve bushings for 8½-in. cross-compound compressors, and permissible variation in the length of the regulating valve in the M-3 feed valve. ¶A few of the roads represented at the meeting recondition used gaskets, but the majority have found it more practical and economical to use new gaskets due to the fact that gaskets once removed were so worn as to be unfit for service. Most of the roads represented at the meeting rebore piston-valve bushings and use over-size pistons and rings. In a few instances the bushings are renewed. ¶The manufacturers fit the M-3 feed valve up to the regulating valve just touching the diaphragm when the diaphragm is in its normal position on the seat with no spring pressure behind it. The valve will operate satisfactorily with the regulating valve clearing the diaphragm by 1/64 in. in this position, or with the regulating valve depressing the diaphragm approximately .008 in. in this position. Further variation than this will cause erratic operation of the feed valve. Meeting held at 150 Broadway, New York City, March 20, 1931. ¶The March meeting of the Manhattan Air Brake Club was devoted to a discussion of renewing piston-valve bushings for 8½-in. cross-compounded air compressors, which subject was carried over from the February meeting; cleaning of main reservoirs, pneuphonic horns and modified reversing valves for 9½-in. steam driven air compressor. The April meeting was featured by a talk on the Siskiyou air brake tests by G. E. Terwilliger, Superintendent of Auxiliary Equipment, New York, New Haven & Hartford.

---

TWENTY-FIVE YEARS AGO.—The first gasoline electric car to be used on the Vanderbilt lines has been completed by the manufacturer for the Lake Shore & Michigan Southern [now part of the New York Central]. The car is operated by a 220-hp. gasoline engine in connection with an electric generator and is designed for a speed of 65 miles per hour. The Missouri Pacific has under construction a steam-motor car for passenger service which is designed to accommodate 64 passengers.—Railway Age, April 6, 1906.

## Directory

*The following list gives names of secretaries, dates of next or regular meetings and places of meeting of mechanical associations and railroad clubs:*

AIR-BRAKE ASSOCIATION.—T. L. Burton, Room 5605 Grand Central Terminal building, New York.

AMERICAN RAILWAY ASSOCIATION.—DIVISION V.—MECHANICAL.—V. R. Hawthorne, 59 East Van Buren street, Chicago. Meeting June 23, 24 and 25, Congress Hotel, Chicago.

DIVISION V.—EQUIPMENT PAINTING SECTION.—V. R. Hawthorne, Chicago.

DIVISION VI.—PURCHASES AND STORES.—W. J. Farrell, 30 Vesey street, New York. Next meeting May 19, 20, 21, Biltmore hotel, Atlanta, Ga.

DIVISION I. — SAFETY SECTION. — J. C. Caviston, 30 Vesey street, New York.

DIVISION VIII.—CAR SERVICE DIVISION.—C. A. Buch, Seventeenth and H streets, Washington, D. C.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—G. G. Macina, 11402 Calumet avenue, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. Thirty-ninth street, New York.

RAILROAD DIVISION.—Paul D. Mallay, chief engineer, transportation department, Johns-Manville Corporation, 292 Madison avenue, New York.

MACHINE SHOP PRACTICE DIVISION. — Carlos de Zafra, care of A. S. M. E., 29 West Thirty-ninth street, New York.

MATERIALS HANDLING DIVISION.—M. W. Potts, Alvey-Ferguson Company, 1440 Broadway, New York.

OIL AND GAS POWER DIVISION.—L. H. Morrison, associate editor, Power, 475 Tenth avenue, New York.

FUELS DIVISION.—A. D. Black, associate editor, Power, 475 Tenth avenue, New York.

AMERICAN SOCIETY FOR STEEL TREATING.—W. H. Eiseman, 7016 Euclid avenue, Cleveland, Ohio.

AMERICAN SOCIETY FOR TESTING MATERIALS.—C. L. Warwick, 1315 Spruce street, Philadelphia, Pa.

AMERICAN WELDING SOCIETY.—Miss M. M. Kelly, 29 West Thirty-ninth street, New York.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Joseph A. Andrucetti, C. & N. W., Room 411, C. & N. W. Station, Chicago, Ill.

ASSOCIATION OF RAILWAY SUPPLY MEN.—J. W. Fogg, MacLean-Fogg Lock Nut Company, 2649 N. Kildar avenue, Chicago. Meets with International Railway General Foremen's Association.

BOILER MAKER'S SUPPLY MEN'S ASSOCIATION.—Frank C. Hasse, Oxweld Railroad Service Company, 230 N. Michigan avenue, Chicago. Meets with Master Boiler Makers' Assoc.

CANADIAN RAILWAY CLUB.—C. R. Crook, 2276 Wilson avenue, Montreal, Que. Regular meetings, second Monday of each month except in June, July and August, at Windsor Hotel, Montreal, Que.

CAR DEPARTMENT OFFICERS ASSOCIATION.—A. S. Sternberg, master car builder, Belt Railway of Chicago.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—G. K. Oliver, 2514 West Fifty-Fifth street, Chicago. Regular meeting, second Monday in each month except June, July and August, Great Northern Hotel, Chicago, Ill.

CAR FOREMEN'S CLUB OF LOS ANGELES.—J. W. Krause, 608 South Main street, Los Angeles, Cal. Meetings second Monday of each month except July, August and September, in the Pacific Electric Club building, Los Angeles, Cal.

CAR FOREMAN'S ASSOCIATION OF OMAHA, Council Bluffs and South Omaha Interchange.—Geo. Kriegler, car foreman, Chicago, Burlington & Quincy, Sixteenth avenue and Sixth streets, Council Bluffs, Iowa. Regular meetings, second Thursday of each month at Council Bluffs.

CAR FOREMEN'S ASSOCIATION OF ST. LOUIS.—F. G. Weigman, 720 North Twenty-third street, East St. Louis, Ill. Regular meeting first Tuesday in each month, except July and August, at American Hotel Annex, St. Louis, Mo.

CENTRAL RAILWAY CLUB OF BUFFALO.—T. J. O'Donnell, executive secretary, Room 1817, Hotel Statler, Buffalo, N. Y. Regular meeting, second Thursday each month, except June, July and August, at Hotel Statler, Buffalo.

CINCINNATI RAILWAY CLUB.—D. R. Boyd, 453 East Sixth street, Cincinnati. Regular meeting second Tuesday, February, May, September and November.

CLEVELAND RAILWAY CLUB.—F. L. Frericks, 14416 Adler avenue, Cleveland, Ohio. Meeting second Monday each month, except July, August and September, at the Auditorium, Brotherhood of Railroad Trainmen's building, West Ninth and Superior avenue, Cleveland.

EASTERN CAR FOREMEN'S ASSOCIATION.—E. L. Brown, care of the Baltimore & Ohio, Staten Island, N. Y. Regular meetings fourth Friday of each month, except June, July, August and September.

INDIANAPOLIS CAR INSPECTION ASSOCIATION.—E. A. Jackson, Box 22, Mail Room, Union Station, Indianapolis, Ind. Regular meetings first Monday of each month at Hotel Severin, Indianapolis, at 7 p.m. Noon-day luncheon 12:15 p.m. for Executive Committee and men interested in the car department.

INTERNATIONAL RAILROAD MASTER BLACKSMITH'S ASSOCIATION.—W. J. Mayer, Michigan Central, 2347 Clark avenue, Detroit, Mich.

INTERNATIONAL RAILROAD MASTER BLACKSMITH'S SUPPLY MEN'S ASSOCIATION.—J. H. Jones, Crucible Steel Company, of America, 650 Washington boulevard, Chicago.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. T. Winkless, Room 707, LaSalle Street Station, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, 1061 W. Wabash street, Winona, Minn.

INTERNATIONAL RAILWAY SUPPLY MEN'S ASSOCIATION.—W. J. Dickinson, acting secretary, 1703 Fisher building, Chicago. Meets with International Railway Fuel Association.

LOUISIANA CAR DEPARTMENT ASSOCIATION.—L. Brownlee, 3730 South Prieur street, New Orleans, La. Meetings third Thursday.

MASTER BOILERMAKER'S ASSOCIATION. — A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y.

MASTER CAR BUILDERS' AND SUPERVISORS' ASSOCIATION.—See Car Department Officers Association.

NATIONAL SAFETY COUNCIL—STEAM RAILROAD SECTION.—W. A. Booth, Canadian National Montreal, Que. William Penn and Fort Pitt Hotels, Pittsburgh, Pa.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meeting, second Tuesday in each month, excepting June, July, August and September. Copley-Plaza Hotel, Boston.

NEW YORK RAILROAD CLUB.—Douglas I. McKay, executive secretary, 26 Cortlandt street, New York. Meetings third Friday in each month, except June, July and August, at 29 West Thirty-ninth street, New York.

PACIFIC RAILWAY CLUB.—W. S. Wollner, P. O. Box, 3275, San Francisco, Cal. Regular meetings, second Thursday of each month in San Francisco and Oakland, Cal., alternately.

PUEBLO CAR MEN'S ASSOCIATION.—I. F. Wharton, chief clerk, Interchange Bureau, Pueblo, Colo.

RAILWAY BUSINESS ASSOCIATION. — Frank W. Noxon, 1124 Woodward building, Washington, D. C.

RAILWAY CAR MEN'S CLUB OF PEORIA AND PEKIN.—C. L. Roberts, chief clerk, Peoria & Pekin Union Railway, 217 Lydia avenue, Peoria, Ill.

RAILWAY CLUB OF GREENVILLE.—Paul A. Minnis, Bessemer & Lake Erie, Greenville, Pa. Meetings third Tuesday of each month, except June, July and August.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 1841 Oliver building, Pittsburgh, Pa. Regular Meeting fourth Thursday in month, except June, July and August. Ft. Pitt Hotel, Pittsburgh, Pa.

RAILWAY EQUIPMENT MANUFACTURERS' ASSOCIATION.—F. W. Venton, Crane Company, 836 South Michigan avenue, Chicago. Meets with Traveling Engineers' Association.

RAILWAY FIRE PROTECTION ASSOCIATION.—R. R. Hackett, Baltimore & Ohio, Baltimore, Md.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 1841 Oliver building, Pittsburgh, Pa. Meets with Mechanical Division and Purchases and Stores Division, American Railway Association.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, M. P. O. Drawer 24, St. Louis, Mo. Regular meetings, second Friday in each month, except June, July and August.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings third Thursday in January, March, May, June, September and November. Annual meeting third Thursday in November, Ansley Hotel, Atlanta, Ga.

SUPPLY MEN'S ASSOCIATION. — E. H. Hancock, treasurer, Louisville Varnish Company, Louisville, Ky. Meets with Equipment Painting Section, Mechanical Division American Railway Association.

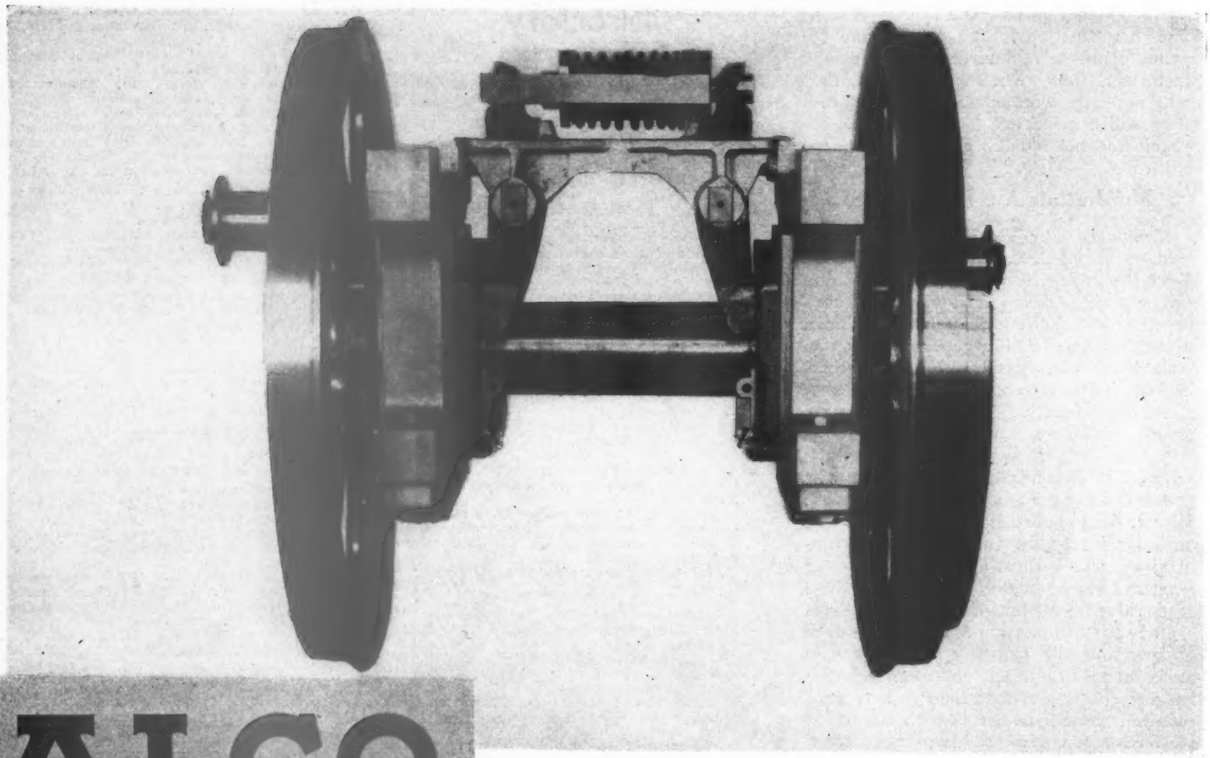
SUPPLY MEN'S ASSOCIATION.—Bradley S. Johnson, W. H. Miner, Inc., Chicago. Meets with Car Department Officers Association.

TORONTO RAILWAY CLUB.—J. A. Murphy, 1405 Canadian National Express building, Toronto 2, Ont. Meetings Third Monday of each month, except June, July and August.

TRAVELING ENGINEERS' ASSOCIATION. — W. O. Thompson, 1177 East Ninety-eighth street, Cleveland, Ohio.

WESTERN RAILWAY CLUB.—W. J. Dickinson, 343 South Dearborn street, Chicago. Regular meetings, third Monday in each month.

(*Continued on second left-hand page*)



# ALCO LATERAL MOTION

MANY efforts have been made to improve the guiding qualities of the locomotive. Setting the tires on different driving wheels with varying distances between them, providing different amounts of hub lateral, using tires without flanges or with flanges of varying thickness and contour have provided some improvement. But none have solved the problem of easily negotiating curves in a manner least destructive to the locomotive mechanism or the right-of-way.

## AMERICAN LOCO

## 30 CHURCH STREET

THE large number of locomotives in trunk line service now equipped with the ALCO Constant Resistance Lateral Motion Mechanism have proven that it is the most efficient device as yet brought out for:

Relieving tire flange pressure and wear as well as driving wheel rod and axle stresses;
Enabling the first and second pairs of driving wheels to equalize their flange pressures and lower the rail stresses;
Increasing the guiding efficiency of the locomotive into and around curves with a minimum of lateral vibration;
Providing lateral resistance movement in line with the journal bearing surface and without varying journal or spring loads;
Providing adjustment of lateral resistance suitable to varying speed or axle loading;
Providing a lateral resistance increasing with the displacement which more effectively swings the spring borne weights while reducing the angular adjustment of side rods to a minimum.

*It Further Provides:*

For dropping wheels without disturbing or disconnecting any parts of the device;
For a maximum of lateral movement each side with resistances increasing to suit the total axle load and speed.

This device is positive in action, simple to maintain, and with the least number of wearing surfaces. It is completely assembled and adjusted in a frame crosstie ready to apply to existing locomotives.

The ALCO Lateral Motion not only enables a rigid wheel base to pass sharper curves, but its many other beneficial results make it almost indispensable from the standpoint of locomotive and right of way maintenance.

If reputation counts, if experience means anything, and if sound engineering in the past is a safe criterion of dependable construction, then the efficiency of the ALCO Lateral Motion Device justifies its application to modern power.

MOTIVE COMPANY
NEW YORK CITY

# NEWS

## Consulting Service on Steel Castings

WITH THE establishment of an engineering department, under the direction of an experienced metallurgist and engineer, the Steel Founders' Society of America is now offering without charge or obligation, a consulting service to mechanical engineers, designers and others engaged in the selection and application of metals and responsible for their proper use in metal products of all kinds. In this service the society offers assistance with such problems as the proper apportioning of metal sections for best casting results; advice as to the types of cast steels which are available to satisfy desired physical specifications; redesign of cast steel members with which trouble has been experienced either in production or service; assistance in locating a foundry capable of handling individual requirements; authoritative information on the relative merits of cast steel as compared with other materials in meeting specific service conditions; consulting on engineering problems involved in the construction of machinery and equipment of all kinds where cast steel is being considered, and informal discussions with small groups of designers and others interested to help them obtain a better working knowledge of the products of the steel foundry.

Problems in metal construction on which help is desired should be addressed to the Development Engineering Department, Steel Founders' Society of America, Inc., 420 Lexington avenue, New York.

## Large Locomotive Tender

ONE OF THE largest tenders ever used with a locomotive in passenger train service on any railroad is now being tested on the Pennsylvania. It is 55 ft. 5¼ in. long and 14 ft. 11½ in. high, from the rail to its highest point, with a water capacity of 25,000 gal., a coal capacity of 25 tons (as much as carried by a regular hopper car in the coal trade 50 years ago), and weighs 142,180 lb. empty and 395,800 lb. loaded to capacity. The K4s locomotive and tender combined measure 104 ft. 9½ in. from coupler to coupler. A comparison of the Pennsylvania's first tender, which served the John Bull locomotive, with the modern 25,000-gal. tank is illuminating. The primitive tender was a sheet iron cylinder 6 ft. in diameter, 6 ft. high, standing in a small flat car. It held 1,150 gal. of water. The diminutive tender weighed 19,600 lb., one-twentieth the weight of the latest model.

A K4s locomotive, with its huge tender, has been assigned to the Pennsylvania's Eastern region for test purposes.

## Erie to Move Executive Offices

PENDING PROPOSALS for the removal of the executive offices of the Erie from New York to Cleveland, Ohio, in order to bring these offices nearer the geographical center of the railroad, were considered and approved at a recent meeting of the board of directors. The move, which will take place late in the summer, will include the traffic, operating, engineering, mechanical, claims and accounting departments, although an executive office and a complete traffic organization (both passenger and freight) will be maintained in New York.

## Progress Reported on Four-System Plan

COUNSEL for the Baltimore & Ohio, the Chesapeake & Ohio, the New York Central and the Pennsylvania are still working on the details of the petition they expect to present soon to the Interstate Commerce Commission for such modification of its consolidation plan as may be required to pave the way for consideration of the plan for grouping the eastern railroads into four great systems. No definite predictions are available, however, as to how much time will yet be required before the petition can be filed.

One step toward the adjustment of one of the important unsettled features of the plan has been taken, it was learned following a meeting of counsel in Washington on March 25, by the appointment of George T. Slade, formerly vice-president of the Northern Pacific and now a director of several railroads, as arbitrator of the question as to the right to the use of the Pennsylvania of trackage over the Nickel Plate between Ashtabula, Ohio, and Brocton, N. Y.

Other points still unsettled involve the price to be paid by the Chesapeake & Ohio-Nickel Plate group for stock of the Lehigh Valley, held by Pennsylvania interests; and the disposition of the Virginian. Executives of the four systems held a conference in New York on March 26 with representatives of the railway labor organizations in an effort to reach some understanding as to principles for the protection of the interests of the employees as they may be affected by unifications.

## Milwaukee Receives Second Locomotor

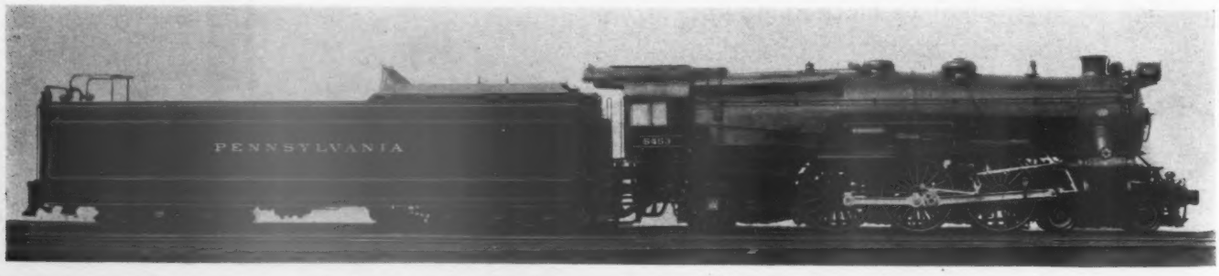
THE CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC has received its second Locomotor, a rail motor coach equipped with a high-pressure, condensing steam power plant, and an initial run was made on April 7, from Chicago to Elgin, Ill., and return. On this run, the car, which was built by the Ryan Car Company, with the power plant furnished by the International Harvester Company, hauled one trailer, and the train was subjected to various operating conditions and rates of speed. The new car is 61 ft. long and weighs 127,000 lb. It is driven by two 8-cylinder unaflow steam engines, capable of developing 225 h.p. each, or a total of 450 h.p. Steam is used at 700 lb. pressure. After the trial run, the car was sent to Cedar Rapids, Iowa, where it was placed in service between Cedar Rapids and Ottumwa.

## Hot Boxes Not So Frequent

THE CHESAPEAKE & OHIO in the year 1930 had only one hot box for 305,481 car-miles and this record, given in the Chesapeake & Ohio Magazine for April, is compared with less successful records back to 1923, when the average was one hot box to each 33,000 miles. This record is credited to the complete co-operation of all individuals and departments having duties connected with this service. Mr. Moler, supervisor of lubrication, says that with proper effort and co-operation, the average can be made one to a million car-miles.

Mr. Moler estimates that each hot box costs at least $20, perhaps $30; and, making the estimate at the lower figure, he calculates that the cost of hot journals on his road for 1924 was $299.480; in 1925,

*(Continued on next left-hand page)*




**A 25,000-Gal. Tender for a Pennsylvania K4s Locomotive**

# A SYMBOL OF SAFETY

In the many plants of Carnegie Steel Company, Safety ranks equally with Production. To promote the practice of Safety, each year a handsome trophy is prepared which is awarded monthly to the plant which has the lowest accident record and is permanently awarded to the plant with the best yearly average. An 86% reduction in lost time accidents in 1929 compared to 1920, the year before this plan was adopted, shows the signal success with which the trophy plan has met.

The 1931 trophy, 30" high, is pictured above. A bronze group, representing the executive, the superintendent and the workman, stands before a silver cross-section of a rail flanked by two car wheels. The whole is mounted on a plinth of bronze beams. William Codman, noted designer of the Gorham Company, was the sculptor.

The inclusion of Carnegie Wrought Steel Wheels in the design of this trophy is a tribute to the remarkable safety record they have made in steam, electric and industrial service. Your safety program will be more effective if Carnegie Wrought Steel Wheels are included in specifications for your equipment.

**CARNEGIE STEEL COMPANY - PITTSBURGH**

*Subsidiary of United States Steel Corporation* 132

U·S STEEL

$198,260; and so on down to 1930 when the total of cases was 3,564, and the cost was $71,280. The total of these expenses since 1924, on this basis of calculation, is nearly $1,000,000.

For the past eight years, the company's brass foundry at Huntington, W. Va., has made about 216,388 journal brasses yearly, 20 men being employed in the work; but on January 11, last, the foundry was closed for lack of orders and moreover no orders for brasses have been given this year to outside markets. Before this, for at least 30 years, this foundry had made journal bearings each and every day.

## DeVilbiss Training School

THE RAPIDLY INCREASING use of the spray method of applying paints, varnishes, lacquers and other protective coatings has resulted in the establishment of a training school for this particular branch of industrial processing by the DeVilbiss Company, Toledo, Ohio. This school, designed to instruct DeVilbiss users in the care, operation and use of spray painting and spray finishing equipment, as well as in the accepted methods of securing all desired results, is open to owners, users, or distributors of DeVilbiss equipment. There is no cost connected with it other than transportation and living expenses.

The student desiring to take this course should first make application to the DeVilbiss Company. Upon approval, he will be assigned a definite date of entrance. While the minimum length of the course is three days, the company prefers that students remain one week, during which period each student is given individual and thorough instruction and practice in all phases of spray painting and spray finishing.

The first part of the course covers the mechanical features of spray painting and finishing equipment. The student is next taught to operate and service the equipment, finally specializing in actual spray painting, spray finishing, decorating or refinishing work.

## Prof. A. J. Wood Dies

ARTHUR J. WOOD, head of the department of mechanical engineering at Pennsylvania State College, State College, Pa., died on Saturday, April 18, after having been struck by a motorcycle. Professor Wood was born at Newark, N. J., on September 3, 1874. He attended high school at Boonton, N. J., his education being continued at Stevens School (1892); Stevens Institute of Technology (M. E. 1896); Columbia University Graduate School (1898), and Pennsylvania State College (M. S. 1916). From 1896 to 1900 Professor Wood was on the staff of the Railroad Gazette, now the Railway Age. He was instructor of mechanical engineering at Worcester Polytechnic Institute from 1900 to 1902 and professor of mechanical engineering at Delaware College from 1902 to 1904. He went to Pennsylvania State College as assistant and associate professor of experimental engineering in 1904 and from 1910 to 1921 was associate professor and professor, railroad mechanical engineering, becoming head of the department during the latter year. Professor Wood was also consulting engineer

A. J. Wood

for railroads and engineering companies. He was the author of Principles of Locomotive Operation; Pre-determination of Locomotive Performance; Investigation of Railroad Car Radiators; Researches in Heat Transmission; The Economical Thickness of Insulation in Refrigerator Cars, and numerous articles and papers on the design of insulation for refrigerator cars and methods of testing heat transmission. He was a member of the American Society of Mechanical Engineers and the American Institute of Refrigeration and a past president of the American Society of Refrigerating Engineers.

## P. & S. Contest Winners

THE FOURTH annual contest conducted by the Purchases and Stores division of the American Railway Association for papers by junior officers and members of railway purchases and stores departments on subjects relating to the work of those departments resulted in the awarding of the honors to Emmet J. Dennedy, stock clerk in the office of the division storekeeper of the Baltimore & Ohio at Ivorydale, Ohio, and William Courage, trucker at the general stores of the Canadian National at Fort Rouge, Winnipeg, for having written the two best papers. Mr. Dennedy's paper was entitled "Mechanical Power," and that of Mr. Courage, "Can Future Requirements Be Anticipated More Accurately?" The two papers share the honors equally and their authors will be rewarded by a trip to the annual convention to be held in Atlanta, Ga., where they will present their papers.

## Bucyrus Shops Litigation

THE CITY OF BUCYRUS (Ohio) has been granted a temporary injunction enjoining the New York Central from removing its shops in that city to Collinwood, Ohio, near Cleveland. The city contends that it gave the railroad the ground on which its shop buildings now stand with the stipulation that buildings and equipment would revert to the city if the railroad should ever abandon them. Evidence produced at the court hearing showed that in 1880 the Ohio legislature enacted a statute giving a city the right to enter into such a contract with any railroad or industrial concern.

*(Continued on next left-hand page)*

## Domestic Orders Reported During April, 1931

### Locomotives

| Name of Company | Number ordered | Type | Builder |
|---|---|---|---|
| Bush Terminal Company | 7 | Oil-Electric | Ingersoll-Rand |
| Total for month | 7 | | |

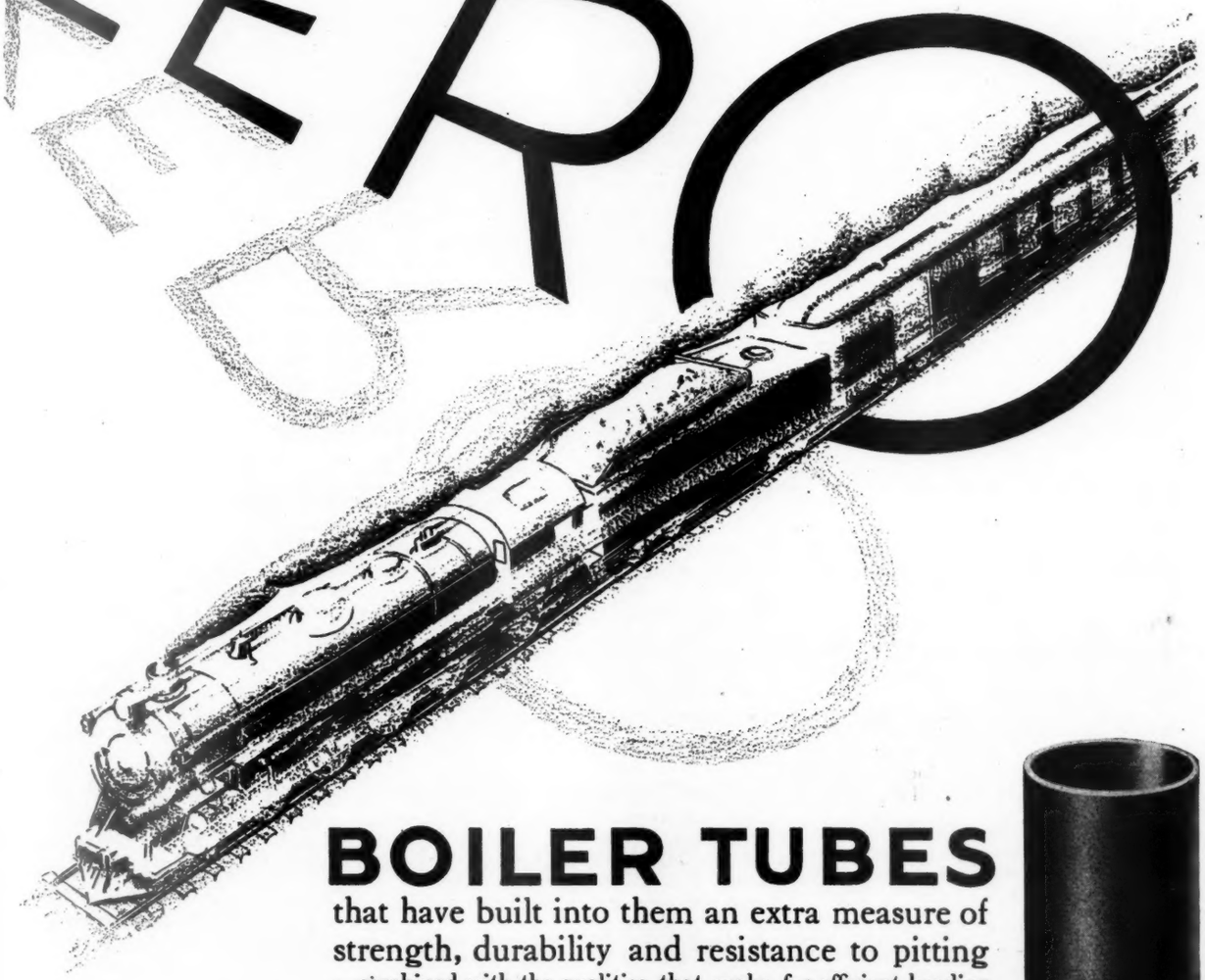
### Freight Cars

| Name of Company | Number ordered | Type | Builder |
|---|---|---|---|
| Delaware, Lackawanna & Western | 25 | Dump | Magor Car Corp. |
| | 10 | Dump | Koppel Industrial Car & Equipment Co. |
| Minneapolis & St. Louis | 100 | Flat | General American Car Co. |
| Sheffield Farms Company | 12 | Tank | General American Pfaudler Corp. |
| Delaware & Hudson | 100 | Box | Company Shops |
| Great Northern | 500 | Hopper | Standard Steel Car Corp. |
| General Chemical Company | 15 | Tank | American Car & Fdry. Co. |
| Northern Pacific | 500 | Box | Company Shops at Brainerd, Minn. |
| | 500 | Stock | Como Shop, St. Paul, Minn. |
| | 500 | Box | Company Shops at Laurel, Mont. |
| | 500 | Box | Company Shops at Brainerd, Minn. |
| Thunder Bay Quarries Co. | 6 | Dump | Koppel Industrial Car & Equipment Co. |
| Union Tank Car Co. | 15 | Tank | American Car & Fdry. Co. |
| Erie | 1 | Dump | Koppel Industrial Car & Equipment Co. |
| Chicago, Milwaukee, St. Paul & Pacific | 4 | Dump | Western Wheeled Scraper Co. |
| Total for month | 2,788 | | |

### Passenger Cars

| Name of Company | Number ordered | Type | Builder |
|---|---|---|---|
| Kansas City Southern | 4 | Baggage and Mail | Pullman Car & Mfg. Corp. |
| Total for month | 4 | | |

# Helping reduce engine troubles to ZERO



## BOILER TUBES

that have built into them an extra measure of strength, durability and resistance to pitting —combined with the qualities that make for efficient beading and holding in the flue sheet, are obviously the tubes that cut down replacements and help reduce engine troubles to zero.

NATIONAL-SHELBY Seamless Locomotive Boiler Tubes are made to one high standard only and that standard includes every quality necessary to meet the most exacting requirements of modern railway service. Ask for Bulletin No. 12, describing NATIONAL-SHELBY Seamless Tubes—

*America's Standard Boiler Tubes*

**NATIONAL TUBE COMPANY, Pittsburgh, Pa.**

**Subsidiary of United States Steel Corporation**

# NATIONAL SEAMLESS

# Supply Trade Notes

THE OFFICES OF the American Railway Car Institute have been moved from 61 Broadway to 19 Rector street, New York.

THE PRESSED STEEL CAR COMPANY has moved its New York Office from 55 Broad street to 80 Broad street.

THE ALMA DRAFT GEAR CORPORATION has moved its offices from 110 East Forty-second street to 68 William street, New York.

A. W. LAUDER, general sales manager of the Lyon Metal Products Company, Aurora, Ill., has been elected vice-president.

FOOTE BROTHERS GEAR & MACHINE COMPANY, Chicago, has moved its general offices from 111 North Canal street to 215 North Curtis street.

THE PACIFIC CAR & FOUNDRY COMPANY has purchased the Bacon Matheson Forge Company and will move the facilities to Renton, Wash.

THE GALENA OIL CORPORATION has moved its New York office from 41 East Forty-second street to 25 West Forty-third street.

THE PATTERSON-SARGENT COMPANY has moved its New York office from 30 Church street to the Chrysler building, 135 East Forty-second street.

THE CURTIN-HOWE CORPORATION, New York, has moved its executive offices from 11 Park Place to the Chrysler building, 405 Lexington avenue.

THE PRESSED STEEL CAR COMPANY plans to rebuild part of its mill at Brandon avenue and 136th street, Chicago, which was destroyed by fire on April 8.

FLOYD K. MAYS, vice-president of the Bradford Corporation, New York, has been elected president, to succeed Horace Parker, resigned.

GEORGE W. H. ALLEN has been elected a director of the American Locomotive Company to succeed the late Frederick H. Stevens.

THE PITTSBURGH-DES MOINES STEEL COMPANY, Pittsburgh, Pa., has moved its New York office from 50 Church street to 270 Broadway.

EDWIN T. HALL, representative of the Sullivan Machinery Company, with headquarters at Boston, Mass., has been promoted to manager of this office to succeed George H. Richey, deceased.

A. C. MOTHERWELL, formerly in charge of forging plants at Detroit, Mich., and Flint, for the General Motors Corporation, has been appointed representative of the Standard Forgings Company, Chicago.

THE BUCYRUS-ERIE COMPANY, South Milwaukee, Wis., has taken over the manufacture and sales of the Loadmaster, a full-revolving boom crane, formerly marketed by Frederic H. Poor, Inc., New York.

CLARENCE H. HOWARD, chairman of the board of the General Steel Castings Corporation, Clarence H. Howard, Jr., manager of the foreign department, and E. Howard Hooper, assistant to the chairman, have resigned.

ALFRED F. HOWE, who retired as vice-president and general sales manager of the Borden Company, Warren, Ohio, in 1926 has been appointed western manager of this company, with headquarters at 717 Calmar avenue, Oakland, Cal.

WILLIAM L. BROWN, 1600 Arch street, Philadelphia, Pa., has been appointed a special agent of the Ohio Locomotive Crane Company, Bucyrus, Ohio, for the sale of its products in the southeastern territory.

THE HARNISCHFEGER SALES CORPORATION, Milwaukee, Wis., has moved its New York office from the Hudson Terminal building, 50 Church street, to the Empire State building, Thirty-fourth street and Fifth avenue.

FRANK K. TUTT, district manager of the Bird-Archer Company, New York, with headquarters in that city, has been elected vice-president, with headquarters in Chicago. H. C. Harrigan, vice-president, has been transferred to New York.

HARRY W. PETTY, formerly Cleveland district sales manager of the American Steel Foundries, has been appointed representative of the Union Steel Castings Company, with headquarters at Pittsburgh, Pa.

WILLIAM L. BROWN has been appointed special representative of the Argyle Railway Supply Company, Chicago, with headquarters at 1600 Arch street, Philadelphia, Pa., and will handle the sale of stoves and sand driers in that territory.

S. M. KINTNER, assistant to vice-president of the Westinghouse Electric & Manufacturing Company, with headquarters at East Pittsburgh, Pa., has been elected vice-president in charge of engineering, with the same headquarters.

WALTER H. WIEWEL has been appointed sales manager of The Timken Steel & Tube Company, Canton, Ohio, replacing A. J. Sanford, resigned. Mr. Wiewel has been associated with the company for several years as manager of steel sales in New York City. He will have his headquarters at Canton.

THE INTERNATIONAL DERRICK & EQUIPMENT COMPANY, Columbus, Ohio, and the Stacey Engineering Company which operates the P. H. & F. M. Roots Company and the Connersville Blower Company, Connersville, Ind., have merged, forming the International Stacey Corporation, with general offices in Columbus, Ohio.

J. B. BARTHOLOMEW, formerly western manager of sales engineers in the Chicago office of the Bethlehem Steel Company, has been appointed contract manager for the McClintic-Marshall Corporation, with headquarters at Chicago.

WILLIAM T. KILBORN, formerly vice-president and general manager of sales of the Graham Bolt & Nut Company, has been elected vice-president in charge of sales of the Hammond Bolt & Nut Corporation, Hammond, Ind., with general offices in the Peoples Gas building, Chicago.

THE GREAT NORTHERN has let contracts to the Railway Engineering Equipment Company, Chicago, for direct steaming systems in the enginehouses at Great Falls, Mont., and Whitefish and Williston, N. D., and for all pipe work in the power house and water treating plant at Great Falls.

THE HASKELITE MANUFACTURING CORPORATION, Chicago, has moved its New York office from 501 Fifth avenue to the Knickerbocker building, 152 West Forty-second street. Joseph A. Potchen was recently transferred to the New York territory in an engineering and sales capacity to succeed James J. Dunne.

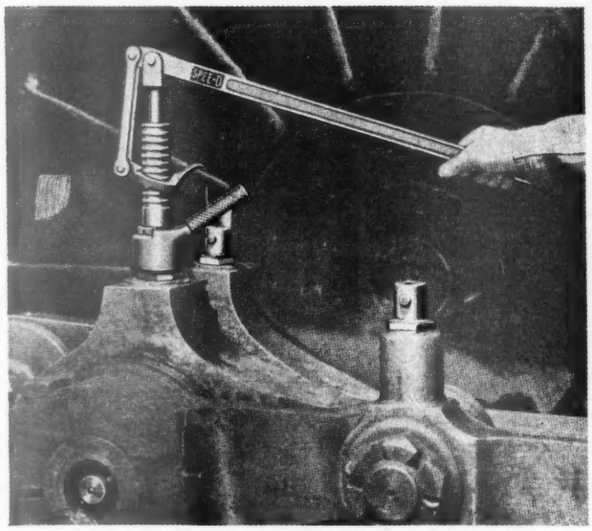
ALCO PRODUCTS, INC., a division of the American Locomotive Company, has opened a district sales and construction office at 1203 Philtower building, Tulsa, Okla. M. A. Hayes is general superintendent in charge of construction; T. B. Leech is sales engineer. A similar office has been opened in the Esperson building, Houston, Tex., in charge of R. H. Brinton.

THE ARMCO RAILROAD SALES COMPANY, which handles the sales of wrought steel wheels, locomotive jacket sheets, car siding sheets and plates, and galvanized black and blue annealed sheets to the railroads for the American Rolling Mill Company, Middletown, Ohio, has opened a district sales office at 1120 Midland Bank building, Cleveland, Ohio. W. N. Crout is the district sales representative.

THE INDUSTRIAL BROWNHOIST CORPORATION, will consolidate the Cleveland, Ohio, and Bay City, Mich., manufacturing operations of the corporation in one plant at Bay City as promptly as conditions make it possible to do so, retaining at Cleveland the general offices including the administrative, financial, sales, purchasing, accounting, and part of the engineering departments. Six to eight months will probably be required for the gradual transfer of manufacturing operations to Bay City.

THE WHITCOMB LOCOMOTIVE COMPANY, Rochelle, Ill., has been organized as a subsidiary of the Baldwin Locomotive Works to take over the George D. Whitcomb Company following the purchase of the properties and going business at public auction on April 13. The company will continue to build gasoline, gas-electric, Diesel and Diesel-electric storage battery and trolley locomotives from three-ton to 100-ton rating. The officers of the com-

*(Continued on next left-hand page)*




# Think It Over

THERE is only one way to obtain all of the economies offered by the "SPEE-D" High Pressure Method of rod cup lubrication, i. e. standardization.

The more engines you equip the lower your lubrication costs—the less trouble you will have with hot bearings, the fewer your failures and delays and the greater your savings.

Used on over 40 large railroads, standard on many.

RELIANCE MACHINE & STAMPING WORKS, Inc.
NEW ORLEANS, LA.
*Agents and Representatives*
H. C. MANCHESTER, 3736 Grand Central Terminal, New York City
CONSOLIDATED EQUIPMENT COMPANY, Montreal
MUMFORD MEDLAND, LTD., Winnipeg
INTERNATIONAL RAILWAY SUPPLY COMPANY, 30 Church St., New York City
A. L. DIXON, 325 W. Ohio Street, Chicago, Ill.

*Saves Time, Labor, Grease and Grease Plugs*

*Trade Mark Registered*

pany are as follows: President, George H. Houston, president Baldwin Locomotive Works; vice-president, John P. Sykes, senior vice-president, Baldwin; vice-president and general manager, Harold H. Perry, formerly vice-president, Industrial Brownhoist Corporation, Cleveland, Ohio; Secretary, Arthur L. Church, secretary and assistant treasurer, Baldwin; treasurer Charles E. Acker, treasurer, Baldwin.

P. B. BIRD, chairman of the board of the Bird-Archer Company, New York, has also been elected president to succeed L. F. Wilson, president and general manager, retired. After a brief leave of absence, Mr. Wilson will assume duties associated with the locomotive water conditioner and other mechanical equipment developed in the service of the company. J. E. O'Brien, vice-president, has been elected vice-president and general manager, with headquarters in Chicago.

EDWARD C. BULLARD, vice-president and and director of the Bullard Company, Bridgeport, Conn., has been appointed general manager of that company to succeed

Edward C. Bullard

his uncle, the late Stanley Hale Bullard. Mr. Bullard is the first of the third generation of the family to assume so important a position in the organization. He is a native of Bridgeport, and received his early education in the Curtis School, Brookfield, and in the University School, Bridgeport, where he prepared for Yale (Sheffield) Scientific School, from which he was graduated in 1917 with honors. After familiarizing himself by actual contact with the duties of the several divisions of the Bullard Company plant, he was made assistant to his father, Dudley B. Bullard, chief engineer, in 1926. Three years later he was appointed an engineer in charge of design and research, and in 1930 was elected a vice-president.

WILLIAM A. CALLISON, JR., has been appointed a sales representative at Chicago, of the American Locomotive Company and the Railway Steel-Spring Company. After graduating from Purdue University, Mr. Callison spent a short time with the International Nickel Company, leaving there to spend two years at the Schenectady and Dunkirk works of the American Locomotive Company.

GLENN W. CHRISTOPHER, manager of the bar and wire sales of the Youngstown Sheet & Tube Company, Youngstown, Ohio, has been promoted to assistant manager of pipe and sales, and has been succeeded by William W. Brown, district manager of sales at Pittsburgh, Pa., who, in turn, has been succeeded by Guy B. Strausner, district manager at Buffalo, N. Y. Mr. Strausner has been succeeded by Clyde F. Andler, district manager at Youngstown, and the latter has been succeeded by Earl H. Braunbern, assistant district sales manager at Youngstown. Robert D. MacKenzie, acting district sales manager at Cleveland, Ohio, has been appointed district sales manager to succeed G. G. Stuart, deceased.

THE SHEPARD NILES CRANE & HOIST CORPORATION recently changed its sales office in Pittsburgh, Pa., to the Grant building. Roy M. Hurst, for many years connected with the company and until recently in its New York office, is now in charge as district manager. Frank J. Kinney, who represented the company for many years in the Pittsburgh territory, is associated with Mr. Hurst at the Pittsburgh office. The corporation has also changed its sales office at Cleveland, Ohio, to 1433 East Twelfth street, with Harry A. Baugh in charge as district manager. Mr. Baugh was recently in its Chicago office and for many years served as district manager of the Pittsburgh office.

## Obituary

FREDERICK W. BRUCH, president of the Acme Machinery Company, Cleveland, Ohio, died on Wednesday, April 1.

FREDERICK V. GREEN, formerly vice-president of the Pittsburgh Testing Laboratory, died in New York City on April 16.

ELMER A. LAUGHLIN, inventor of the Durable draft gear and other railway appliances, died in a fire on his farm near Oregon, Ill., on April 1.

GEORGE H. RICHEY, manager of the Boston, Mass., office of the Sullivan Machinery Company, died on April 1. Mr. Richey had been associated with the Sullivan Machinery Company since 1912, and was manager of its New England sales office in Boston from 1919 until his death.

W. W. NEALE, traveling engineer for the American Arch Company, died on April 23 at Baltimore, Md. Mr. Neale had been connected with the American Arch Company for the past eighteen years, being formerly engaged in the mechanical department of the Baltimore & Ohio.

JOSEPH B. TERBELL, chairman of the board of the American Brake Shoe & Foundry Company, who died on April 15, was born at Corning, N. Y., in February, 1863, and was graduated from Hamilton College in 1884 with the degree of A.B. He then served with the Fall Brook Railroad, now a part of the New York Central, and later was vice-president of the Corning Iron Works. He became president in 1897 of the Corning Brake Shoe Company, and in 1902, when that company was merged with the American Brake Shoe & Foundry Company, he was elected vice-president of the latter company in charge of the western business, with head-

Joseph B. Terbell

quarters at Chicago. Mr. Terbell subsequently served as vice-president at New York; in July, 1919, was elected president and in March, 1922, became also chairman of the board. He relinquished the duties of president in June, 1929, serving since that time as chairman of the board.

JOSEPH R. ELLICOTT, formerly eastern district manager of the Westinghouse Air Brake Company, died of heart disease at his home in Ormond Beach, Fla., April 16, at the age of 73 years. Mr. Ellicott was born in Batavia, N. Y., but his family later moved to Grand Rapids, Mich., where he received his early education. He entered railroad service at the age of fifteen as a fireman on the Michigan Central. In 1877 he was given a position in the claims department of the Chicago & North Western, and later became traveling auditor, first for the St. Paul, Minneapolis & Omaha, and then for the Chicago & North Western. He then became, successively, general manager of the Ajax Forge Company, Chicago; eastern sales manager of the Griffin Wheel & Foundry Company, New York; organizer and director of the General Agency Company, a railway supply company, New York, and in 1898 general manager of the Standard Air Brake Company. In 1901 the Standard Air Brake Company was taken over by the Standard Traction Brake Company, which in turn was controlled by the Westinghouse Air Brake Company. Mr. Ellicott became manager of the company, with headquarters in New York, and when the Westinghouse Traction Brake Company was formed to succeed the Standard Company, in 1903, he retained the position of manager of the new company. In 1905 he was appointed New York district manager both of the Westinghouse Traction Brake Company and the Westinghouse Air Brake Company. In 1919 Mr. Ellicott was relieved of active duty and since that time had remained in a consulting capacity. He was for several terms president of the American Electric Railway Association.

(*Continued on next left-hand page*)

# TIME IS MONEY

## -in the life of a freight car

**A car's earning capacity depends upon how long it can be kept in revenue service. Good draft gears *increase* the earning capacity by providing adequate protection against the shocks of collision—thus keeping cars off the rip track and in revenue service more days per year, and more years before they must be discarded.**

**Replace present inadequate draft gears with Cardwell or Westinghouse Draft Gears.**

CARDWELL WESTINGHOUSE CO.
332 S. Michigan Avenue, Chicago, Ill.
PITTSBURGH, PENNSYLVANIA
MONTREAL, QUEBEC, CANADA

Cardwell L-23 Friction Draft Gear
Cardwell Gears are made to fit any length of yoke or draft gear pocket.

Cardwell and Westinghouse Draft Gears

Are made in sizes and capacities to meet all modern and A. R. A. requirements for locomotives, freight and passenger cars.

Westinghouse NY-11-D Friction Draft Gear

Westinghouse Draft Gears can be applied with any type of attachments.

GOOD DRAFT GEARS MAKE CARS GO FARTHER

# Personal Mention

## General

E. SCHMITZ, traveling engineer of the Chicago, Milwaukee, St. Paul & Pacific at Montevideo, Minn., has been appointed traveling engineer on the LaCross-River division, first district.

J. C. SHREEVE has been appointed superintendent of motive power of the Elgin, Joliet & Eastern, with headquarters at Joliet, Ill., succeeding J. Horrigan who has retired after nearly 37 years of continuous service with the E. J. & E.

J. E. INGLING, assistant to general manager of the Erie, has been appointed supervisor of fuel and locomotive operation, with headquarters at New York.

THE JURISDICTION of T. McFarlane, traveling engineer of the Chicago, Milwaukee, St. Paul & Pacific, Eastern lines, has been extended to include the Iowa and Southern Minnesota division, second district.

## Master Mechanics and Road Foremen

J. E. HARDY has been appointed road foreman of engines of the Birmingham division of the Southern, with jurisdiction between Birmingham, Ala., and Atlanta, Ga., and Birmingham Terminal.

H. E. LOGAN, road foreman of locomotives on the Chicago, Burlington & Quincy at Galesburg, Ill., has been promoted to master mechanic of the Centerville division at Centerville, Iowa.

THE JURISDICTION of William Joost, master mechanic of the Chicago, Milwaukee, St. Paul & Pacific at Milwaukee, Wis., has been extended to include the Madison division.

THE JURISDICTION of F. P. Miller, master mechanic of the Chicago, Milwaukee, St. Paul & Pacific at Portage, Wis., has been extended to include the second district of the La Crosse-River division.

THE JURISDICTION of A. M. Martinson, master mechanic of the Chicago, Milwaukee, St. Paul & Pacific at Mason City, Iowa, has been extended to include the second district of the Iowa and Southern Minnesota division.

JOHN A. TURTLE, master mechanic on the Union Pacific at Denver, Colo., since 1903, retired from active duty on April 1 after more than 50 years in the service of the mechanical department of that railroad.

JOHN TURNEY, master mechanic of the Twin City terminal and the River, Iowa, Minnesota and Duluth divisions at Minneapolis, Minn., has been transferred to the Sioux City and Dakota Division at Sioux City, Iowa, succeeding W. C. Kenney, who has been assigned to other duties.

J. S. FORD, master mechanic of the Centerville division of the Chicago, Burlington & Quincy at Centerville, Iowa, has been transferred to the La Crosse division at North La Crosse, Wis., succeeding C. W. Robertson, who at his own request has been assigned to other duties.

## Car Department

J. R. CONNORTON has been appointed supervisor of air brakes of the Erie, with headquarters at Meadville, Pa.

WILLIAM MCCABE, car repairman of the Reading, has been promoted to the position of assistant car foreman, Wayne Junction shop, Philadelphia, Pa.

G. H. HIGLEY has been appointed general air brake inspector of the Erie, with headquarters at Meadville, Pa., succeeding T. W. Dow, retired.

## Shops and Enginehouse

J. H. STALLINGS, a machinist at the Finley shop of the Southern at Birmingham, Ala., has been promoted to the position of assistant foreman, machine shop.

R. H. HARRINGTON, night enginehouse foreman of the Southern at Forrest shop, Sheffield, Ala., has been promoted to the position of general foreman.

T. P. KELLY, gang foreman in the boiler erecting shop of the Pennsylvania at Altoona, Pa., has been appointed acting assistant foreman, boiler shop.

W. S. EDMISTON, assistant foreman in the boiler shop of the Pennsylvania at Altoona, Pa., has been appointed acting foreman of the boiler shop at Juniata.

G. G. SICKLES, gang foreman in the boiler erecting shop of the Pennsylvania at Altoona, Pa., has been appointed acting assistant foreman of the boiler erecting shop.

THE JURISDICTION of G. Lamberg, shop superintendent of the Chicago, Milwaukee, St. Paul & Pacific at Minneapolis, Minn., has been extended to include the Twin City terminal and Duluth division.

ANTON MEYER, assistant foreman in the boiler erecting shop of the Pennsylvania at Altoona, has been promoted to the position of foreman of the boiler erecting shop.

## Purchasing and Stores

CLYDE L. WAKEMAN, has been appointed general storekeeper of the Wabash, with headquarters at St. Louis, Mo.

E. A. ERNST, district storekeeper on the Chicago, Rock Island & Pacific at Shawnee, Okla., has been transferred to Horton, Kans., succeeding C. H. Schneider, deceased.

J. C. GLENN has been appointed division storekeeper of the Central of New Jersey and the New York & Long Branch, with headquarters at Elizabethport, N. J., succeeding C. A. Marshall, resigned.

THE POSITION of district storekeeper of the Chicago, Rock Island & Pacific at Shawnee, Okla., has been abolished and C. P. Clark appointed division storekeeper at that point.

RALPH I. RENFREW has been appointed district storekeeper of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Beech Grove, Ind., succeeding C. V. Coulter, retired.

F. M. BAUMGARDNER, who served as master mechanic on the Illinois Central at Clinton, Ill., from 1912 to 1914, died at his home at Detroit, Mich., on April 16.

EDWARD J. SUMMERS, fuel supervisor of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Chicago, died at his home in that city on April 15.

THOMAS J. JOHNSON, foreman of the wheel and axle shop of the Nashville, Chattanooga & St. Louis at Nashville, Tenn., who retired four years ago, died at his home in Nashville on April 1.

CHARLES H. SCHNEIDER, district storekeeper on the Chicago, Rock Island & Pacific, with headquarters at Horton, Kan., died at St. Luke's hospital, Chicago, on March 21.

# Trade Publications

***Copies of trade publications described in the column can be obtained by writing to the manufacturers. State the name and number of the bulletin or catalog desired, when mentioned in the description.***

CUTTING TOOLS.—"Cutting Costs with Cutting Tools" is the title of a new booklet issued by the O. K. Tool Company, Shelton, Conn., in which the principle of the O. K. serrated tooth system is described.

LOADMASTER.—The new bulletin published by the Bucyrus-Erie Company, South Milwaukee, Wis., describes and illustrates the Loadmaster, a small crane unit having a full-revolving boom. The unit, mounted on wheels or crawlers, can pass through an opening 66 in. wide and requires a head clearance of only 8 ft. 10 in.

WELDING.—"Better Welds with Armco Ingot Iron" is the title of the new 40-page booklet of the American Rolling Mill Company, Middletown, Ohio. The booklet opens with a chapter describing Armco ingot iron, which is immediately followed by a chapter showing where the iron is used by welders. Another chapter contains useful engineering data and the addenda describes miscellaneous welding operations.